THE MARINE REVIEW

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OLD STEAMBOAT DAYS ON THE HUDSON RIVER.

David L. Buckman has written a highly entertaining book entitled "Old Steamboat Days on the Hudson River," which has been published by the Grafton Press, 70 Fifth Avenue, New York. In this work he has preserved a great deal of historical data of value that otherwise would have been lost. His sources of information have been at first hand and his father for many years commanded the old North America, and his grand uncle long before that commanded the sloop Robert Burns. Mr. Buckman certainly begins at the very beginning of steamboat days because he begins with Clermont. Incidentally he refers to experiments with steam navigation prior to Fulton's invention. Incidentally also he tells much that is interesting of Fulton himself, who was a man of many parts. Fulton began life as a portrait painter and supported himself abroad for a number of years by the practice of this profession. Mechanical science was in his early days merely an avocation with him, for we find him devoting his spare time in Paris to the study of mathematics and chemistry. He turned his mind to the production of torpedoes and invented a submarine boat which underwent a successful test in the harbor of Brest. Both the French and English governments considered his inventions, but gave him no practical aid.

Meanwhile in conjunction with many others he had conceived the idea of propelling boats by steam. Among the others was Chancellor Robert R. Livingston of New York who was so sure that he had solved the idea that he secured the passage of an act by the New York legislature giving him the exclusive right of navigating boats by steam on the waters of the state for 20 years, provided that he produced a boat within one year that could make four miles an hour. Livingston failed and later went to France as United States minister, where he met Fulton. Together they built a boat on the Seine in 1803 and equipped it with an engine, but so light did they make the craft and so heavy the machinery that it fell through the bottom of the boat. They decided to pursue their subsequent experiments in the United States.

Livingston was no ordinary man. He was a member of the committee that drafted the Declaration of Independence. He administered the oath of office to George Washington as first president of the United States and he negotiated the purchase of Louisiana from Napoleon. Fulton and Livingston became fast friends and Fulton later married Livingston's daughter. Before returning to America Fulton, after making the contract with Livingston to build the boat on the Hudson, hastened to England, where an order was placed for the machinery. The machinery was built at Birmingham and shipped to the United States. The hull was built on the East River, New York. When completed she was named Clermont, in honor of Livingston's country seat on the east shore of the Hudson. On Aug. 17, 1807, the Clermont left New York for Albany, making the trip in 32 hours. The New York legislature accordingly granted to Livingston and Fulton the exclusive privilege of running steamboats on the waters of New York state for 20 years, and thereby laid the foundation of a very great mischief which vexed the people of the United States for many years until it was effectually quieted by Chief Justice Marshall of the United States Supreme Court in one of those clear and splendid decisions which are the bulwarks of the American constitution. Were this country to build a monument as high as huge Olympus to John Marshall it would be but as a mole hill compared with his acts.

After her first season the Clermont was enlarged and renamed the North River. As soon as the success of steam navigation was demonstrated by the Clermont Fulton turned his attention to steam ferryboats on the North and East Rivers. The Jersey was put on the rivers in 1812 and the York in 1813. These took the place of old ferryboats which were propelled by driving two and four horses around and around in the hold of the boat. The horses were attached to a pole connected with a gear movement that rotated the paddle-wheels. Fulton also developed the pontoon of floating bridge dock that rises and falls with the tides and makes it possible for wagons to drive on and off the boats substantially as they do today. Fulton died in 1815 after having built the steamers Car of Neptune and Paragon and having designed the Chancellor Livingston. He did not live to see the Livingston, however.

The succeeding chapters are crowded with interesting reminiscences which it is impossible to repeat in a brief review, but which are of absorbing interest. The reminiscences are not alone of steamers but of their masters, and some of them certainly were odd characters. One of the steamers, the Armenia, had installed upon her a steam calliope and was considered quite remarkable when she first came out. It was soon discovered, however, that the demand of the calliope upon the boilers for steam was so great that the boat could make little progress while the calliope was playing. The calliope was accordingly taken out and sent to the junk shop.

The exclusive grant to Fulton and Livingston before it was declared unconstitutional, provoked no end of trouble between the states of New Jersey and New York bordering on

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the Hudson and it looked for a while as though the two states would actually come to blows. A young man who had been running a sailboat ferry between Staten Island and New York became interested in the subject. His name was Cornelius Vanderbilt, who was later to found the first great American fortune and to deliver a famous epigram which has survived his life and will probably outlive his fortune. The epigram, as every citizen knows, was "The public be damned."

Vanderbilt entered into the Hudson river competition with all the vigor of his intense nature. New York was placarded from one end to the other with posters as lurid as ink could make them and barkers were employed to drum up trade. If a man or a woman appeared on the wharves carrying a carpet bag the barkers assailed them at once and frequently the bag went by one boat while the passenger went by another. As there was great fear on the part of the public at that time that the boilers would burst, the particularly nervous ones, especially old ladies, were assured by the barkers that their steamboats had no boilers.

Vanderbilt went into the trade to get it and he got it by building better boats and carrying passengers for lower fares. For a while it was possible to travel from New York to Albany for 10 cents. This marvelous man abandoned Hudson river traffic when gold was discovered in California. He found it more profitable to project a line of steamers from New York to the Isthmus of Panama. He later developed the Hudson River railroad which has since become one of the great trunk lines of the country, with the New York Central and the Lake Shore as its leading parts.

Mr. Buckman recounts the famous steamboats of the Hudson river, practically all of them being of the side-wheel type, and makes especial reference to the Mary Powell, dear to the heart of every ship and engine builder, for she was for a generation the queen of American side-wheel steamers, and though built in 1861 is today a wonder among them. The Mary Powell was built for Capt. A. L. Anderson, who sailed her for many years, and she is today being sailed by his son, Capt. A. E. Anderson. The Mary Powell for many years was owned by the Anderson family, but she was recently acquired by the Hudson River Day line. Yachts built especially for speed have all that they can do to keep up with the Mary Powell.

Mr. Buckman naturally devotes some space to the famous races between steamboats on the Hudson. Those races were a counterpart of the famous Mississippi river races, where safety valves were weighted down and boiler pressure increased beyond safe limits. Especial attention is paid to the race between the Oregon and the Cornelius Vanderbilt for $1,000. The Oregon won this race but only by burning up all the berths, chairs, benches, furniture of staterooms and everything inflammable that can be thrust into the furnace. Races between steamboats are nowadays things of the past, though it is only five years since the City of Erie raced the Tashmoo on Lake Erie; but such a performance is not likely to be repeated.

A chapter is devoted to the disasters of river travel. It must be stated, however, that while some have been appalling, the list has not been numerous, considering the fact that it is now 100 years since the Clermont made her initial trip to Albany.

A chapter is also devoted to canal boats, and there is also incorporated a chronological list of the prominent Hudson river steamboats from 1807 to 1907, compiled by S. W. Stanton. This book is highly recommended to those that want an interesting and authentic history of steamboating on the Hudson river.

WOOD FOR PAPER COSTS TWENTY-SIX MILLIONS.

Today there is general complaint among publishers that printing paper is constantly growing dearer. In the middle west many local papers are raising their subscription price 50 per cent in order to pay for the paper. From the time when Gutenberg first used movable type, made of wood, to the present day of metropolitan papers, some of which consume the product of acres of spruce in a single edition, printing has in very large degree depended upon the forest.

In the face of a threatened shortage of timber, the amount of wood consumed each year for pulp has increased since 1899 from 2 million to 3½ million cords. The year 1906 marked an increase of 93,000 cords in the imports of pulpwood, the highest average value per cord for all kinds, and a consumption greater by 469,053 cords than that of any previous year.

Spruce, the wood from which in 1899 three-fourths of the pulp was manufactured, is still the leading wood, but it now produces a little less than 70 per cent of the total. How well spruce is suited to the manufacture of pulp is shown by the fact that during a period in which the total quantity of wood used has doubled and many new woods have been introduced, the proportion of spruce pulpwood has remained nearly constant in spite of the drains upon the spruce forests for other purposes. During this time three different woods, from widely separated regions, have in turn held the rank of leader in the lumber supply.

Since 1899 poplar, which for years was used in connection with spruce to the exclusion of all other paper woods, has increased in total quantity less than 100,000 cords, and is now outranked by hemlock. Pine, balsam and cottonwood are used in much smaller amounts.

New York alone consumes each year over a million and a quarter cords of wood in the manufacture of pulp, or more than twice as much as Maine, which ranks next. Wisconsin, New Hampshire, Pennsylvania and Michigan follow in the order given. Sixty per cent of the wood used in New York was imported from elsewhere, and even so the supply appears to be waning, since the total consumption for the state shows a small decrease since 1905, whereas the other states named have all increased their consumption. Other states important in the production of pulp are: Massachusetts, Minnesota, Ohio, Oregon, Vermont, Virginia and West Virginia.

The average cost of pulp delivered at the mill was $7.21. The total value of the wood consumed in 1906 was $26,400,000. The chief item determining the price of paper is the cost of pulp. An example of the increased price of paper is found in the case of a publisher of a daily in the middle west, who recently paid $1,200 for a carload of paper. The same quantity and grade of paper cost a year ago but $800.

The chemical processes of paper making, which better preserve the wood fiber, are gaining over the mechanical process. In 1899, 65 per cent of the wood was reduced by the mechanical process; in 1906, less than 50 per cent.

All importations of wood for pulp are from Canada, and comprised, in 1906, 739,000 cords, nearly all of which was spruce. Four and a half million dollars' worth of pulp was imported in 1906, a slight falling off from 1905.

Circular 120 of the forest service contains a discussion of the consumption of pulpwood in 1906, based on statistics gathered by the bureau of the census and the forest service. The pamphlet can be had upon application to the Forester, United States department of agriculture, Washington, D. C.

W. & A. Fletcher & Co., Hoboken, N. J., recently gave the Mallory line steamer San Jacinto some repairs to her engine and boilers.

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REVIEW OF BRITISH SHIPPING.

John White, 23a Great St. Helen's, London E. C., in his annual review of British shipping, says:

It is unfortunately the fact that the past year has closed with the shipping industry, both for the ship builder and ship owner, in a more unsatisfactory condition than it commenced. The high cost of production caused a decrease in orders for new tonnage in the latter part of the previous year, and owners, realizing that freights were not commensurate with the cost of ships, and that working expenses continued to increase, have wisely withheld from further building, therefore the number of contracts for ordinary cargo steamers were very few and far between throughout the year. This abstention from building does not materially affect the output of tonnage for the past year, but will be markedly shown in this year's returns. The production of merchant steamers from British yards has been about 1,600,000 tons, which is a reduction of about 200,000 tons on the record total of the previous year. None of our builders have equalled the output of 1906, which from two yards alone was over 100,000 tons each. The largest total last year was by Messrs. Doxford, of 91,254 tons, while four other yards have produced about 300,000 tons, so that one-quarter of the total large production is accounted for in five yards, and then not engaged to their full capabilities. The following figures show the variation of the British register during the past year:

Added of new steamers and bought from foreigners, about 1,301,500 tons.

Removed, which includes steamers lost, broken up and sold to foreigners, about 657,700 tons.

Added of sailing ships, about 75,900 tons, of which about 47,500 tons were to the colonial register.

Removed of sailing ships about 185,600 tons, of which about 55,800 tons were colonial.

There were under construction on Sept. 30, last, according to the records of Lloyd's Register, steamers of 1,068,422 tons, which is a reduction of about 200,000 tons of the tonnage building 12 months previously.

The net addition to the British register, after deducting losses, broken up and sold to foreigners, for the 10 years 1897 to 1906, was 5,488,938 tons steamers, and the net reduction of sailing ships 1,230,641 tons. The increase of the effective tonnage is large, being of steamers, but a very large amount is represented in the leviathan passenger liners, and the very considerable total of meat, oil, fruit carriers, trawlers, railway steamers, etc. The extension of commerce in the same period has also been very great. The export of coal alone increased from 34,000,000 tons in 1896 to 55,500,000 tons in 1907. The carriage of grain from long distances — River Plate, Australia and west coast of America—to countries of quickly increasing populations such as our own, instead of as formerly from nearer sources—America, Russia, etc., which now have so much need for their own production — has created lengthened voyages for the present large merchant fleet. At the same time, it has to be borne in mind that increased foreign tonnage takes much of the trade, especially of the coal exports.

The contracts of the past year to our ship building yards include several steamers for the P. & O. Co.'s mail services; a steamer for the Hamburg-American Line, reported to be larger than the Cunarder Mauretania, although not so fast; a steamer of 23,000 gross tons for the Holland-America Line; steamers for the Navigazione Generale Italiana, Lloyd's Sabaudo (of Italy), Chargeurs Reunis, the Pacific Steam Navigation Co., the Booth Line, and several large oil carriers.

At the commencement of the past year it was reported there was a large demand for steel and iron at home and from America and Japan, but by the end of the first quarter the reports in regard to raw material were very different, and later news came from America that there was no demand. Owing to the high price of hematite, Scotch steelmakers increased their price of plates in May from £7 12s 6d to £7 15s, but soon afterwards the reduced orders forced prices down, and by repeated small reductions plates are now down to £6 12s 6d. Further decline in price appears likely and warranted by the changed condition of the demand from other sources as well as ship building, and from the knowledge that ship builders have that our steel makers have been supplying foreign customers at a price stated to be 15s per ton lower than home orders. Copper is now nearly half the price it was 12 months since, which enables engineers to substantially reduce their prices. Prices of new tonnage to build are about 10 per cent lower than a year since. Builders have requested a reduction of wages of their men, which is necessary from the changed condition of trade. The amalgamation of Messrs. Harland & Wolff, of Belfast, with Messrs. John Brown & Co., of Glasgow, is an addition to the strong combinations of ship builders that have been made of late years. Another step in the decline of the Thames interest in manufacturing for this industry has occurred in the retirement from business of the old engineering firm of Messrs. Humphreys, Tennant & Co.

WAGES AND STRIKES.—Increased wages were demanded by engineers and other workmen in the first quarter of the past year, which the masters, with the knowledge that further orders to follow the current work were scarce, declined to concede, and an agreement was made with the men postponing any increase until the state of trade warranted such; but in September, when the prospects of work were still more unfavorable, the men repeated their demands, causing the employers to threaten a lock-out, which speedily made the men withdraw their request, and a joint agreement was made which should preclude strikes in the future. The men have evinced a disinclination to abide by agreements entered into by their leaders, and to be dissatisfied with the financial state of their unions, of which many of the branches are reported to be insolvent. Sectional strikes of workmen, such as calkers, carpenters, joiners, molders, patternmakers, and blast furnace men, etc., have caused much interruption with work. Strikes continue prevalent in almost every branch connected with shipping, causing serious losses to employers and men, and in scarcely one instance securing any benefit to the men. There have been strikes of seamen in British and many foreign ports; laborers, prominently the longshoremen, for many weeks in New York, which necessitated some liners having to bring back part of their cargoes to this country and back again so as to maintain regular sailings.

The Pend d'Oreille Navigation Co., Newport, Wash., is about to let a contract for the construction of a stern-wheel steamer to operate on the Pend d'Oreille river, which will in all probability be built at a Spokane yard. The steamer is to be 130 ft. long, 26 ft. wide and of less than 3 ft. draught. It will be necessary to ship the vessel knocked down to Newport, where it will be erected and run in conjunction with the two other steamers owned by this company.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., is repairing the Maryland, Delaware & Virginia Railway Co.'s steamer Essex she having been dry docked for attention to her outboard machinery.

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WALTERS PROPELLER.

The Walters Propeller Co., Ltd., Liverpool, England, are open to treat for the sale of the patent rights of their propeller in the United States. The company certainly gives its propeller a splendid endorsement by guaranteeing, under cash penalties, an extra half knot in fine weather on the same indicated horsepower on any steamer against any other propeller in the same metal, and a knot in head seas. The company represents that by means of a differential pitch superimposed upon a large hub—masked fore and aft by cones—it practically eliminates the useless middle portions and the whole power of the engines is thrown onto the broad blade-tips. The company has received the following excellent testimonial from the Liverpool, Bristol & Hayle Steamship Co., Ltd.:

"We have pleasure in certifying that we recently fitted the steamer Cornubia with a Walters propeller; that company guaranteeing us an extra half knot on the same or less consumption, and a knot in head seas, on 'No Cure, No. Pay' terms.

"In order to obtain exact comparative data, we first put the steamer over the measured mile; the mean of six runs showing 9.2 knots on 76 revolutions. After fitting the Walters' propeller, we again tried her over the measured mile; the mean of six runs showing 9.8 knots on 74 revolutions, the vessel being an inch deeper in the water, an increase of six-tenths of a knot. This result is corroborated by loaded sea passages, the increased speed in head seas being particularly marked, being reported by careful comparison with other steamers as one and a half knots per hour. The steamer now takes from 2½ to 3 hours less on her 30-hour passages from Liverpool to Hayle or Bristol, and vice versa, and is therefore able to catch tides which she was quite unable to do before. She also comes astern and answers the helm much more readily than she previously did. We are thoroughly satisfied with the propeller, which has amply fulfilled all the Walters Co. claimed for it."

The Newport News Ship Building & Dry Dock Co., Newport News, Va., is repairing the new lumber steamer Nann Smith, which was recently completed by them and started to her destination at San Francisco. She encountered a severe gale off Cape Hatteras and was injured so that is was necessary for her to seek shelter, afterward returning to the yard for repairs.

SUMMARY OF NAVAL CONSTRUCTION.

The summary of naval construction, issued by the bureau of construction and repair, navy department, shows the following state of progress upon naval vessels:

Name of Vessel.	Building at—	—1907-8.— Per cent of completion. Dec. 1, 1907.	Jan. 1, 1908.
BATTLESHIPS.			
Mississippi	Wm. Cramp & Sons	98.01	98.65
Idaho	Wm. Cramp & Sons	91.24	94.12
New Hampshire	New York S. B. Co.	93.10	95.30
South Carolina	Wm. Cramp & Sons	31.68	33.76
Michigan	New York S. B. Co.	33.50	37.90
Delaware	Newport News S. B. Co.	5.08	7.05
North Dakota	Fore River S. B. Co.	7.84	12.70
ARMORED CRUISERS.			
North Carolina	Newport News S. B. Co.	95.17	96.00
Montana	Newport News S. B. Co.	89.49	91.31
SCOUT CRUISERS.			
Chester	Bath Iron Works	94.00	95.15
Birmingham	Fore River S. B. Co.	91.88	93.71
Salem	Fore River S. B. Co.	90.29	92.09
TORPEDO BOAT DESTROYERS.			
T. B. Destroyer No. 17	Wm. Cramp & Sons	00.00	00.00
T. B. Destroyer No. 18	Wm. Cramp & Sons	00.00	00.00
T. B. Destroyer No. 19	New York S. B. Co.	00.00	3.40
T. B Destroyer No 20	Bath Iron Works	00.00	00.00
T. B. Destroyer No. 21	Bath Iron Works	00.00	00.00
SUBMARINE TORPEDO BOATS.			
Submarine T. B. No. 9	Fore River S. B. Co.	99.00	99.00
COLLIERS.			
Vestal	Navy Yard, New York	55.30	58.80
Prometheus	Navy Yard, Mare Island	19.60	22.04
TUG BOATS.			
Patapsco	Navy Yard, Portsmouth	31.00	35.00
Patuxent	Navy Yard, Norfolk	27.00	32.00

WILL ENTER THE MACHINE TOOL FIELD.

The Republic Belting & Supply Co. of Cleveland in addition to their manufacturing of leather belting and supply business will enter the machine tool field. They have secured the exclusive agency for the Becker-Brainard Milling Machine Co. of Hyde Park, Mass., for the Ohio territory, and have secured the services of Wm. H. Mortimer, who for a number of years has been the Cleveland agent for the Becker-Brainard Co. Mr. Mortimer's office in the Williamson building has been given up and he will act as assistant sales manager in the machinery department for the Republic Belting & Supply Co.

Another new accession to the ranks of the selling force will be F. W. Bowler, who for several years has been connected with the Patterson Supply Co., and who for the past few months has been sales manager at the Cleveland office of the Modern Machinery Co. The machinery department of the Republic Belting & Supply Co. is to be in charge of S. C. Cutler (vice president), who has had charge for the company of the sales in this territory for the B. F. Sturtevant Co. and the Sturtevant Mill Co. Until additional floor space can be secured the Republic Belting & Supply Co. will carry only a limited stock of machine tools, but expects eventually to carry a full line for those concerns for which it has the agency.

The Republic Belting & Supply Co. have also made important additions in the belting department, having secured the services of H. S. Hull, formerly in charge of the outside sales for the E. R. Ladew Co. of New York, manufacturers of belting; and Frank S. Bennet, formerly of the Maloney & Bennet Co., Chicago, manufacturers of leather belting, who will have charge of the Republic Belting & Supply Co.'s factory and production department.

Bids for the construction of the steamer Umatilla, to be used in connection with the improvement of the upper Columbia and Snake rivers, opened Dec. 20, by Col. S. W. Roessler, corps of engineers, United States army, Portland, Ore., were as follows: Willamette Iron Works, Portland, Ore., boat complete, $55,245, machinery alone, $32,745; Portland Iron Works, Portland, Ore., boat complete, $59,650, machinery alone, $36,100; Theodore Knutson, Portland, Ore., hull alone, $23,500; Phoenix Iron Works, Portland, Ore., machinery alone, $32,000; Joseph Supple, Portland, Ore., hull alone, $27,600; Smith & Watson, Portland, Ore., $32,850.

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ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
1005 West Street Bldg.,
New York City.

Charles M. Taylor's Sons, Philadelphia, announce they have arranged for a regular service of three steamers in the Furness line, making a direct sailing every three weeks between Philadelphia and Avonmouth. If successful a fourth steamer may be added, making the service a fortnightly one. The steamers in the service will be the Almeriana, London City and Gulf of Ancud, the Almeriana sailing from Philadelphia early in February.

The schooner wrecked on Diamond shoals during the heavy storm that swept the Atlantic coast last week has been positively identified as the Leonora, from Round Pond, Me. She was bound for Charleston, S. C., with a cargo of fish scrap. The cook was the only member of the crew saved.

To bring to the attention of members of congress the need of, and to induce legislation to obtain, better facilities for life saving on the coast in the vicinity of Point Judith, R. I., Frank S. Gardiner, secretary of the National Conference, has forwarded to each member a memorial, with resolutions of the conference. It is estimated that 10,000 passengers go around Point Judith on a summer night, while the value of freight traffic is over $200,000,000 annually. Mr. Gardiner points to the increasing traffic passing the Point, and the inadequate facilities for saving life or caring for the shipwrecked.

Revenue cutters Nos. 17 and 18, which are now building at Newport News Ship Building & Dry Dock Co., and revenue cutters Nos. 20 and 21, building at the New York Ship Building Co., are being equipped with the Reilly multicoil heaters and evaporators. In the revenue cutter service as well as all other types of marine work, it is especially important that the weight of machinery be kept down as low as possible and the use of the Reilly units above specified have enabled a considerable saving in this matter. It is expected that the temperature of the feed water leaving the Reilly heaters will be not less than 230 degrees which is the temperature generally procured by these heaters when the supply of auxiliary exhaust steam is sufficient. The Norfolk & Washington fast steamer of 3,000 H. P. which is expected to make remarkable speed is also being equipped with the Reilly heater and it is expected that the high feed temperature made possible by using this heater will greatly assist the boilers and enable them to keep up a high pressure of steam when being forced.

After spending six weeks in this country studying the Atlantic passenger trade, F. M. Vermorcken, director of the North German Lloyd, sailed Saturday on the Lusitania. He was accompanied by Herman Winter, assistant general manager of the company in America. They will attend a preliminary meeting of the continental lines in London on Jan. 18, prior to the conference of the British and continental lines on Jan. 21 at the Savoy hotel in London, which is to be held to consider the situation and better the condition of the passenger trade between the United States and Europe.

The steamer Lexington, of the Merchants' & Miners' line, which was driven ashore off James Point, Md., during the night of the 8th, was refloated on the 10th and proceeded on her trip to Savannah. The cargo which had been taken out of the Lexington to lighten her was towed to the mouth of the Patuxent river, where the steamer stopped and reloaded.

Consul General Edward L. Adams, of Stockholm, reports the beginning of a movement for establishing a direct line of steamships between Swedish and American ports, as instituted by the Swedish-American Society of Stockholm.

The report of Steamboat Inspectors W. L. Withey and John Stewart in connection with the disaster to the Joy line steamer Larchmont, which collided with the schooner Harry Knowlton off Block island, Feb. 11 of last year, places the responsibility for the disaster upon the pilot, and absolves from blame Captain McVey and the rest of the crew.

At the Kelvin memorial meeting held in the Engineers' building, New York, this week, the topics and speakers were: "Lord Kelvin as an Electrical Engineer," Prof. Elihu Thomson; "Lord Kelvin as a Scientist," Prof. E. L. Nichols; "Lord Kelvin in Naval Engineering," Rear-Admiral Melville; "Lord Kelvin's Work in Submarine Telegraphy," G. G. Ward; "Lord Kelvin and the American Institute of Electrical Engineers," T. C. Martin.

After a lengthy investigation, which has just been concluded, it has been found that Ulysses A. Hubbard, master of the steamer John Lenox, and William I. Emmons, pilot of the ferryboat Queens, which were in collision off the Battery on Nov. 12, 1907, were both at fault, and suspended for 15 days. In commenting on the circumstances of this case, Supervising Inspector Ira Harris pointed out that vessels passing the Battery from the westward have a tendency to hug the shore and pass dangerously near the Battery slips, and, owing to the growth of shipping, warns masters and pilots that they must adhere to the letter of the law on this matter.

The tug Catherine Moran, which left New York for Panama on Oct. 25, has arrived at her destination. The run was made in 76 days without a mishap.

The British steamship Glenaen left Philadelphia this week for the Mediterranean with 179,035 bu. of wheat, loaded at the Girard Point grain elevators. The vessel was loaded in 5½ hours.

Noah was rushing preparations.

"Trying to get off before Roosevelt puts a surgeon in command," he explained.

Herewith he hastily shoved away from shore.—*N. Y. Sun.*

Ice is being reported much earlier than usual, several large and medium-sized bergs having been seen by the incoming steamers.

The British steamship Montrose, of the Canadian Pacific railroad service, stopped at Queenstown on her way from Antwerp to St. John, N. B., to take aboard the passengers of the steamer Mount Royal.

The British steamship Housatonic, a bulk oil carrier, was wrecked on Maiden Rock, County Antrim, Ireland, early on Sunday morning, two of the crew being drowned in getting away the boats.

The Housatonic has been for several years in the Philadelphia and Europe petroleum trade, and when wrecked was in ballast from Barrow for New York. She was owned by the Anglo-American Oil Company.

The government tug Apache on Sunday returned to the Brooklyn navy yard after having destroyed the wreck of the Estelle Phinney off Barnegat, N. J.

On Tuesday word was received at New York that a steamer bearing a strong resemblance to the long overdue Mount Royal had been reported 250 miles west of Fastnet Light, southwest of Ireland. The Mount Royal on Tuesday was 30 days out from Antwerp, and is supposed to have put back owing to the breaking down of her engines.

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INLAND WATERWAYS COMMISSION.

Last year President Roosevelt appointed a commission known as the Inland Waterways Commission which, it is herewith predicted, will eventually be regarded as one of the wisest acts of his administration. Senator Newlands, of Nevada, has now supplemented the president's initiative by the introduction of a bill providing for the appointment of an Inland Waterways Commission and for the creation of a special fund to be known as the Inland Waterway Fund, to be used in the examination, survey and development of the inland waterways of the country. The bill appropriates $50,000,000 for the fund. The commission is to investigate all questions relating to the development and improvement of inland waterways for transportation purposes; to consider and co-ordinate the questions of irrigation, swamp land reclamation, clarification of streams, utilization of water power, prevention of soil waste, protection of forests, regulation of flow, control of floods, transfer facilities and sites and the regulation and control thereof, and such other questions as relate to the development of rivers, lakes and canals for purposes of commerce. It will be seen that the provisions of this measure are very sweeping. Senator Newlands is a member of the Inland Waterways Commission which was appointed by the president last year and which made a tour of the country. This commission has been in frequent session since April last. In addition to visiting all sections of the country in person it has been represented at the various conferences and conventions which have been held throughout the country to consider the development of waterways.

Senator Newlands' bill as stated appropriates $50,000,000 for the work. It also provides that when the sum falls below $20,000,000 the president of the United States shall issue bonds to supply the deficiency. In other words, there shall be continuously available an abundance of capital. Senator Newlands explained that he desired the sum of $50,000,000 actually set aside in the treasury to be used for no other purpose whatever and to be subject to the uses of the commission precisely as a surplus would be subject to the uses of a great constructive corporation—in other words, that the commission be relieved of the hampering restrictions which are inevitably entailed when sums have to be appropriated as the work advances. During the course of discussion, Senator Hepburn asked if only $10,000,000 were expended in the next five years, would the other $40,000,000 remain idle in the treasury. Senator Newlands replied by saying that if the commission contemplated spending only $10,000,000 within the next five years it would better not begin the work at all. He said his expectation was that the commission would expend at least $50,000,000 a year for the next five years. This bold announcement seemed to surprise Senator Beveridge, but Senator Newlands advocated that within the next 10 years the United States should spend at least $500,000,000 in the improvement of its inland waterways. The work ought to be prosecuted contemporaneously in every section of the country. It should be entrusted to a commission of experts that will have the power to initiate both investigation and construction and with ample funds to complete its projects—not a commission that will have to wait upon the tardy work of congress as to projects, the details of which it is incapable of dealing with.

Senator Newlands' bill contemplates the co-ordination of all the related uses of water and that stamps it at once as the broadest practical measure that congress has ever had to deal with. The related uses of water involve everything. It is so broad that it comprehends the drop of water that falls upon the leaves of the trees, to find its way eventually into the earth and to seep, through the processes of nature, into the springs that form the small tributaries of navigable rivers. The development of a river for purposes of navigation does not consist alone of deepening the channels by dredging or the removal of shoals, but the prevention of the formation of such obstructions as well. To maintain a stream in a state of navigation all the year round it is necessary to conserve its resources. Rational treatment of a navigable river would be the prevention of floods to which it may be subjected. All the rivers in the west have their sources in the snows of the mountains and in the spring are subject to torrential streams which flood the valleys and destroy much property, while in the summer they are reduced to mere rivulets incapable of floating even small canoes. The rational treatment of such rivers involves the creation of great reservoirs, where waters might be held until they are loosed again in the sum-

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mer, to be used, if need be, for purposes of irrigation. Such water will in any event eventually reach its natural channel because it will be given out by the land through seepage when it is most needed, that is to say during the hot months. Rivers which traverse forest countries bear a normal supply of water all the year round. The forests are the great conservators of moisture. A barren land will transfer moisture such as rain immediately to the rivers, but the forest will check it drop by drop, transfer it to springs and gradually let it find its outlet in the rivers.

Senator Newlands argues that the conserving of a stream to navigable uses involves the question of forestry. He is in favor of planting trees for that very purpose. His argument is, in every way, a big one and will undoubtedly cause the development of our waterways to be approached from a new direction.

GRAIN MEN GRUMBLING.

Buffalo, Jan. 14.—There is a grumbling complaint from the grain interests of the steel winter-storage fleet because there is considerable leaking here and there and spoiling the grain, sometimes enough to make it necessary to unload a cargo. The grumble is the more uncompromising on account of the claim that the trouble is a mere matter of carelessness on the part of the owner of the vessel. A steel steamer makes a fine floating grain bin if it is properly taken care of, but the grain men say that the ore and coal traffic through the season do not mind a small leak here and there, so the owner gets into the habit of letting them go and when he comes to take in a grain cargo in order to get business for his fleet through the winter he takes his chances of their behaving all right in that traffic also.

The insurance also grumbles of course, but that is an interest that has not always been strong enough to act up to its convictions and so it pays up and the difficulty is not corrected. Vessel men appear to agree that the leaks are largely in the bottom and come from rivets having been loosened by either the chuting in of the ore or from the contact of the clam shell hoisting apparatus, either of which must strike the bottom of a vessel with a sharp impact. One vessel man remarks that the bottom of a steel steamer's hold is of course over a water tank and there ought not to be much water to come in contact with the grain unless the tank is well filled with water or is shaken about a good deal. The ship builders disclaim any close knowledge of the difficulty. They turn everything out watertight, they say, though it has always been a fact, of course, that a steel plate is not a sure water guard, however well calked, till it is proven to be, so that to carry grain in a new steel bottom is always risky. These complaints are not made as a matter of serious concern, but to keep people from being careless about lesser things. It appears to be a fact that there is less serious apprehension as to the future of the steel lake vessel than there was a dozen years ago, or possibly at any time since steel began to take the place of wood in ship building. The thing to do, then, is to pick up a few of the minor and more easily corrected faults and go ahead. It is true, for all that, that the insurance interests see a great difficulty yet in the matter of strandings. The ship yards may not do any grumbling in that line, so long as the insurance pays the loss and they get the repairs to do, but it is a serious matter.

As to what the insurance is going to do about the strandings, or indeed about anything for the next season everything is at sea yet. One of the underwriters said the other day that he could not give any outline yet of the policy of next season. Somehow the vessel interests seem to be more independent of the underwriters than they used to be, so that there is not much dictating to them, either as to construction plans or hull rates. If one set of underwriters will not take the risks another will and if there is any serious difference the owner of the fleet can carry it all himself sometimes.

While the total losses on the lakes were lighter than in 1906, so that the really valuable carriers are not reduced in number and the fleet goes on increasing by great bounds the collisions were numerous enough to cause much uneasiness on the part of the insurance at least and when added to the losses by stranding the total is sometimes very large.

Of course, the chief cause for concern now is the size of the fleet, as compared with the business in prospect. It is not easy to find the lake man now who believes that the fleet can be kept busy next season, even if the demand for ore returns in time to make sure of something like the usual increase to be moved. At present it is hard to see how there is to be any increase at all and a sharp falling off may take place. If there does what will the fleet have to do? Still some of the business men are expressing great faith in the return of activity before long. A local head of a commercial agency assured a business man last week that by July he would be as far behind his orders as he was last July. The business man could only say he hoped so.

Something must be done before long to get into line for the new barge canal, which is expected to add materially to the size and importance of the lake business. While it will still be several years in construction there are many problems that must be solved in some way before the route to the sea will float the larger craft, which is now said to be more likely to carry 2,000 tons than less, while the party that advocates a draft of 14 ft. is more nearly in authority than the original canal men like to see.

Will it be possible, as some think, to build a craft that is small enough for canal traffic and yet large enough to go up the lakes and to Boston and Norfolk on the coast and make enough money to beat out the boat that must transfer cargo here and in or near New York? Who can tell?

JOHN W. CHAMBERLIN.

The annual ball of the Cleveland lodge of the Ship Masters' Association will be held at the Chamber of Commerce hall on Friday evening, Jan. 24.

The American Ship Building Co. is transforming the steel barges Polynesia and Amazon of the Corrigan-McKinney fleet into steamers. For this purpose the engines will be taken out of the Caledonia and Italia of the same fleet and installed in the barges. New boilers will be provided, 12 ft. in diameter and 12 ft. long, equipped with Ellis & Eaves draft.

At the annual meeting of the Ashtabula Steamship Co. held in Ashtabula last Monday the following officers were elected: E. S. Henry, president; George A. Gaston, vice-president; E. W. Savage secretary and treasurer. These officers together with T. J. Rennick, H. A. McKinnon, Capt. Oscar Olson and Alexander Hynd comprise the board of directors. The new steamer building for this company by the Great Lakes Engineering Works will probably be launched Feb. 15 and will be commanded by Capt. Oscar Olson.

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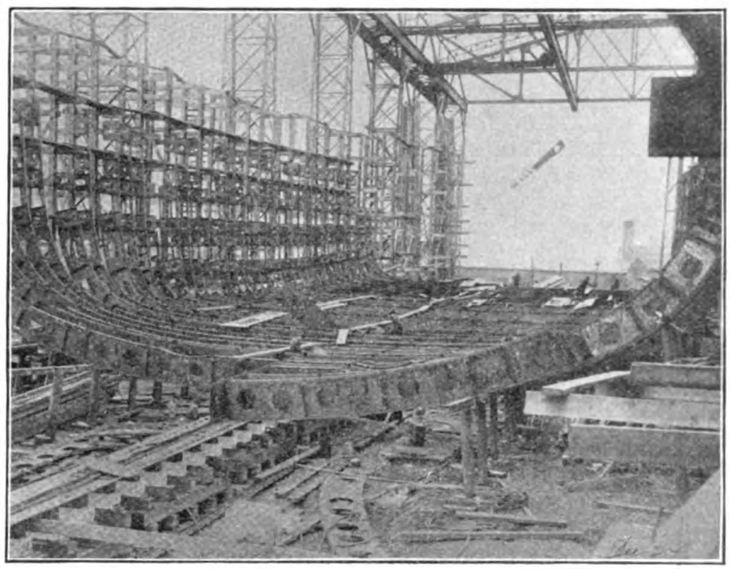
PROGRESS ON BATTLESHIP NORTH DAKOTA.

The Fore River Ship Building Co., Quincy, Mass., has evidently set out to make a record in the construction of the battleship North Dakota. The company hopes to launch this vessel in October next and to deliver her complete well within the contract time of 34½ months, which dates from Aug. 6 last. This time is the shortest for any battleship yet contracted in the country. The accompanying photographs, taken on Dec. 24, Dec. 31 and Jan. 6, show the progress of work. At the present time the work comprises the frame and floors of inner bottom, nearly all of the vertical and flat keels, longitudinals and some protective deck beams together with a portion of strakes of inner and bottom shell plating. Considerable work has also been done on bulkheads, deck beams, frames and plating which has not yet been assembled but which is nearly ready to go into the ship. The work on miscellaneous hull fittings is also well advanced, a large percentage of steel material is either in the ship yard or shipped, and it is expected that all steel schedules will have been rolled by the middle of this month. The work on the turrets is also proceeding and plans and patterns of machinery are well advanced.



BATTLESHIP NORTH DAKOTA ON DEC. 24.

Fire broke out on the package freighter New York at Abram Smith & Son's ship yard at Algonac last week and did about $5,000 worth of damage. The New York is owned by the Port Huron & Duluth Steamship Co., of Port Huron.

SHIP YARD NOTES.

Bids received at the U. S. engineer's office, Portland, Ore., opened Dec. 23, for constructing one 18-in. hydraulic dredge for use in dredging in the coast waters of Oregon and Washington, were as follows:

John Wood Iron Works Co., Portland, Ore.	$87,605
North American Dredging Co., San Francisco, Cal.	96,608
Portland Iron Works, Portland, Ore.	80,174
Willamette Iron & Steel Works, Portland, Ore.	85,140
The Moran Co., Seattle, Wash.	98,427

The Harlan & Hollingsworth Corp., Wilmington, Del., has been awarded contract for overhauling the Wilson line steamships Brandywine and City of Chester.

The Bath Iron Works, Bath, Me., has begun work on the two torpedo boats which it is to build for the United States navy.

The Matthews Ship Building Co., Hoquiam, Wash., recently launched nine pontoons in two days. These are for dredger piping and are 20 x 6 x 6 ft.

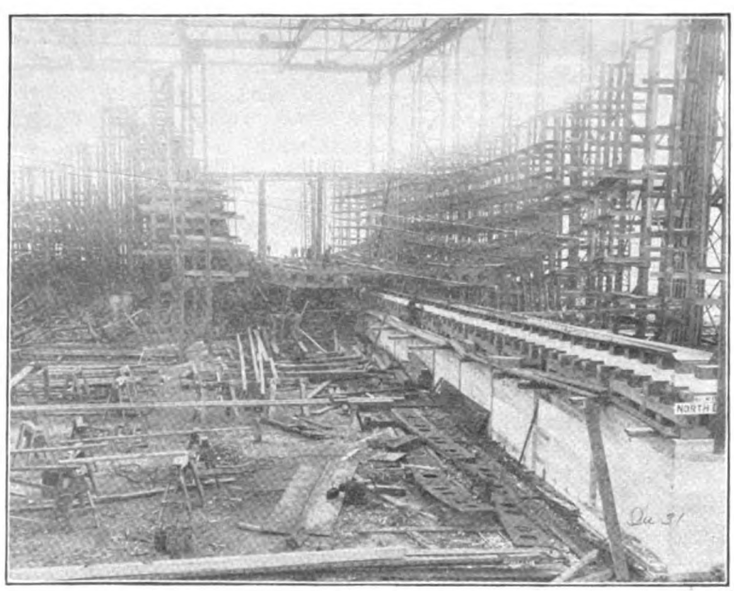
Robert Palmer & Sons, Noank, Conn., launched the tug John J. Timmins Jan. 1. This vessel is owned by the Mutual Towing & Lighterage Co., New York.

The Lawley Corp., South Boston, Mass., has been awarded a contract for the construction of a three-masted steel schooner yacht for W. Harry Brown, of Pittsburg. She will be 200 ft. long and 32 ft. beam, and will be fitted with a 600-H. P. engine.

The Union Iron Works, San Francisco, Cal., has been awarded contract for effecting the repairs to the ship Erskine M. Phelps, owned by Arthur Sewall & Co., Bath, Me. The contract price is $4,270.

The ferryboat Wave, which was built at the Herreshoff yards at Bristol, R. I., for the navy department, and which is to take the place of the old boat of the same name, is ready for delivery.

The Skinner Ship Building & Dry Dock Co., Baltimore, Md., recently repaired the five-masted schooner Elizabeth Palmer, owned by W. F. Palmer, Dorchester, Mass. The damages were sustained in a collision in which the schooner Estelle Phinney was sunk.



BATTLESHIP NORTH DAKOTA ON DEC. 31.

Theodore Knudsen, the Portland, Ore., ship builder, has been awarded contract for repairing the British bark Walden Abbey, his bid being

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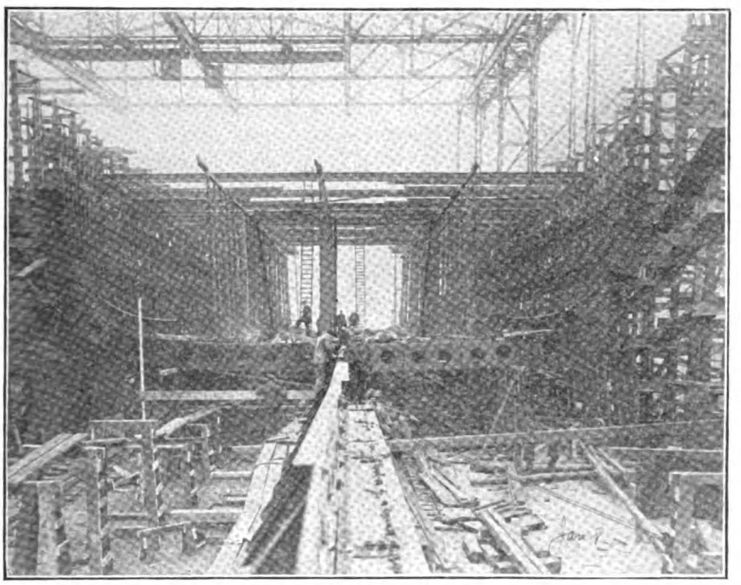
$870. The vessel was battered up while towing over the Columbia river bar and the repairs include the placing of a new wheel and the construction of a lifeboat.

The New England Transportation Co., Portland, Me., is engaged in building two four-masted, single-decked schooners for stock. They are 230 ft. in length over all, with a gross tonnage of 700 each and are valued at $50,000 apiece. They will be fitted with auxiliary engines of 15 H. P.

John Chilman, boat builder at Gray's Harbor, Wash., launched a motor tug recently which was 45 ft. long, 12 ft. 4 in. beam and 4 ft. draught. She was christened the Advance and is designed for towing and general purposes. She is equipped with a four-cylinder Hercules engine of 55 H. P.

William J. Burlee, who was connected with the successful ship yard at Port Richmond, S. I., N. Y., which bears his name, is about to establish a ship building plant at West Point, Va., which is situated on the York river. Mr. Burlee has acquired a tract of timber land 6,000 acres in extent which has a mile of water front with a depth of 50 ft. The new company is said to have orders in hand for considerable work of the nature of car floats and oil barges.



BATTLESHIP NORTH DAKOTA ON JAN. 8.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., launched the steel steamer Lurline for the Matson Steam Navigation Co., San Francisco, Cal., on Jan. 11. The Lurline is 450 ft. in length, 55 ft. beam and 31 ft. deep and has a capacity for 1,000 passengers and 5,000 tons of cargo. The vessel is estimated to have cost $1,200,000. She will go into commission in about four months.

GROWTH OF LAKE COMMERCE.

The accompanying diagram showing the growth of Lake Superior commerce as registered by the ship canals at Sault Ste. Marie is very interesting. It was prepared two years ago by Harvey D. Goulder to illustrate an address on the need of greater facilities for handling lake commerce. The full line shows the freight tonnage from 1855 to 1905 as given in the published official records of St. Mary's Falls canal. The dot and dash line shows the estimated growth based upon a probable percentage of increase from year to year as indicated by the increase of previous years. The interesting thing about the diagram is that the line of probable increase has already been surpassed, the predicted commerce of 1909 having been reached in 1907.

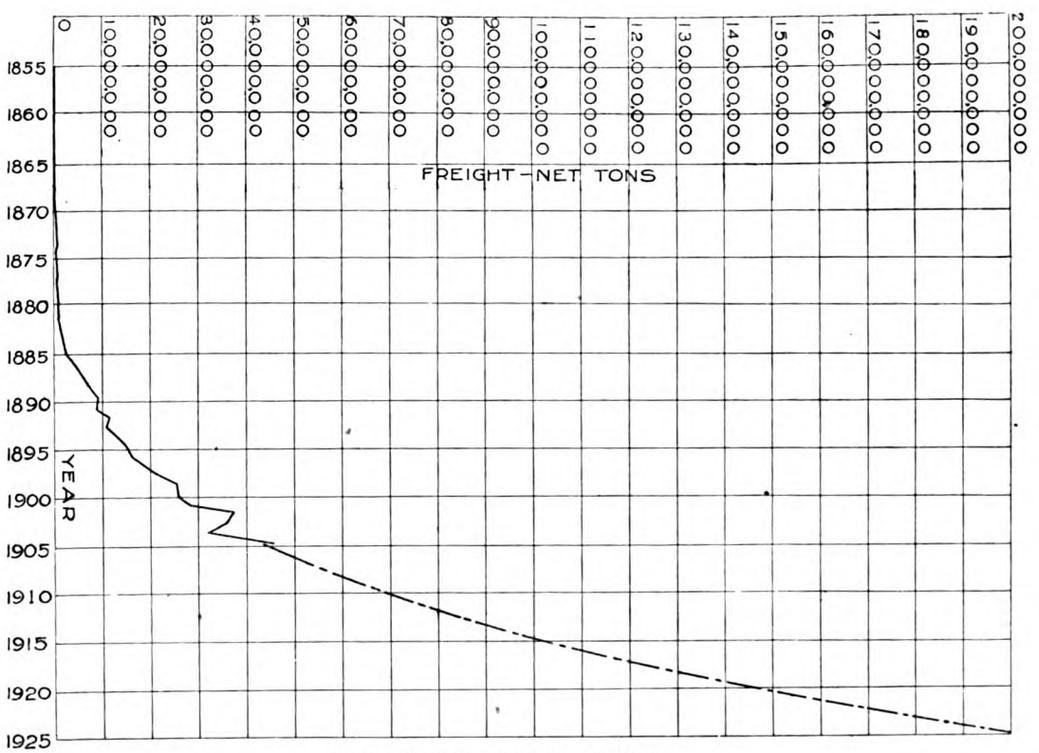


CHART OF LAKE SUPERIOR COMMERCE.

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MACHINERY UNDER CONSTRUCTION.

Collingwood Ship Building Co., Ltd., Collingwood, Ont.:

One Scotch marine boiler for the Northern Navigation Co., Collingwood, Ont.; 14 ft. diameter by 12 ft. long, 180 lbs. working pressure.

One Scotch marine boiler for the Doty Engine Works, Goderich, Ont.; 6 ft. 6 in. diameter by 8 ft. long, 150 lbs. working presssure.

One square fire box marine boiler for the C. S. Boone Dredging Co., Toronto, Ont.; 7 ft. 6 in. diameter by 12 ft. long, 140 lbs. working pressure

One square fire box marine boiler for Graves & Bigwood, Byng Inlet, Ont.; 7 ft. 6 in. diameter by 12 ft. long, 140 lbs. working pressure.

MacKinnon Boiler & Machine Co., Bay City, Mich.:

One fire box marine boiler 5 ft. by 9 ft., 150 lbs. steam pressure for tug Cisco.

Johnston Bros., Ferrysburg, Mich.:

Four 12 ft. 6 in. diameter by 11 ft. 6 in. long Scotch marine boilers for the two new fire tugs building by the Manitowoc Dry Dock Co. for the city of Chicago.

One 11 ft. 6 in. by 13 ft. 6 in. Scotch marine boiler for M. Hausler, South Chicago, Ill.

Two 9 ft. 6 in. by 14 ft. firebox marine boilers for the steamer Parks Foster, Chicago, Ill.

One 6 ft. 6 in. by 13 ft. fire box marine boiler for the steamer Effie L., Superior, Wis.

Globe Boiler Works, Toledo, O.:

Marine upright water tube boiler for the steamer Wayward, Sandusky.

Roberts Safety Water Tube Boiler Co., 39 Cortlandt street, New York.

Roberts safety water tube boilers are being built as follows:

One for the steamer Why Not, 4 by 5 ft., building for the Morse Iron Works, New York; two for the steamer Czarina, 8 by 9 ft., building for A. J. McIntosh, Brooklyn, N. Y.; one for the steamer Helena, 7 ft. by 7 ft. 6 in., building for George Lawley & Son Corp., East Boston, Mass.; one for the steamer Carola, 4 ft. 10 in. by 7 ft. 6 in., building for Leonard Richards, New York; one for the steamer Theresa, 7 ft. 5 in. by 7 ft. 3 in., building for G. Sidenberg, New York; one for the steamer Starling, 9 by 9 ft., building for the Electric Boat Co., Quincy, Mass.; one for the steamer Haddassah, 3 ft. 6 in. by 4 ft., building for H. C. Perrine & Son, South Amboy, N. J.; one for the steamer Sabrina Aurora, 7 ft. 9 in. by 6 ft. 3 in., building for the Submarine Signal Co., Boston, Mass.; one for the steamer Ventura, 5 ft. 3 in. by 4 ft. 6 in., building for C. Simmons, New York; one 4 ft. 6 in. by 6 ft. for the Adam Hock Leather Co., Eatontown, N. J.; four 9 by 9 ft. for the Puget Sound Day Line, Seattle, Wash.; one 6 by 8 ft. for Stanford University, Stanford University, Cal., one 5 by 7 ft. for B. D. Wolff, Rondout, N. Y.; one 8 by 9 ft. for Hungerford Bros. & Co., New York; one 8 by 9 ft. for Robert Jacobs, City Island, N. Y.; two 7 by 10 ft. for H. Fisk & Sons, New York; one 6 by 7 ft. for S. W. Colton Jr., Philadelphia, Pa.; one 5 by 7 ft. for the S. M. Price Machine Co., Norfolk, Va.; one 8 by 9 ft. for the Winter Harbor Co., Philadelphia, Pa.; one 2 by 3 ft. for Major Charles Keller, U. S. engineer at Detroit, Mich.; one 4 by 5 ft. for the Otsego Lake Transit Co., Cooperstown, N. Y.; one 2 ft. 6 in. by 3 ft. 6 in. for Fox Bros. & Co., New York; one 3 ft. 6 in. by 5 ft. for A. N. Rotholz, New York; one 2 ft. 6 in. by 3 ft. 6 in. for Pusey & Jones, Wilmington, Del.; one 8 by 9 ft. for National Lead Co., New York; one 3 ft. 6 in. by 4 ft. for the Home Industry Iron Works, Mobile, Ala.; two 6 by 8 ft. for H. R. Stickney, Portland, Me.; one 3 ft. 6 in. by 4 ft. for H. C. Perrine & Son, South Amboy, N. J.; one 4 ft. 6 in. by 6 ft. for the Johnson Iron Works, New Orleans, La.; one 4 by 5 ft. for the Onset Water Co., Onset, Mass.; one 3 by 4 ft. for C. C. Mengel & Bro. Co., Louisville, Ky.; one 5 ft. 6 in. by 7 ft. 6 in. for the U. S. Revenue Cutter Tybee, building for the U. S. Revenue Cutter Service; one 5 by 7 ft. for the Pusey & Jones Co., Wilmington, Del.; one 2 ft. 6 in. by 3 ft. for Capt. Powell Clayton, U. S. Cavalry, Havana, Cuba; one 2 ft. 6 in. by 3 ft. for Hiram Hammond, Lake George, N. Y.; one 4 by 5 ft. for Eggers & Heinlein, New York; one 8 by 9 ft. for the Lake Ladore Improvement Co.; one 4 ft. 6 in. by 6 ft. for Thomas D. Jordan, Englewood, N. J.

Charles L. Rohde & Sons, Baltimore, Md.:

Two covered lighters for Tillyard & Watkins, Baltimore, Md.; length over all, 80 ft.; approximate value, $3,000 each; estimated gross tonnage, 200 each.

One covered lighter for Maryland Trans. Co., Baltimore, Md.; length over all, 80 ft.; approximate value, $3,000; estimated gross tonnage, 200.

Two open lighters for M. W. Adams, Baltimore, Md.; length over all, 85 ft.; approximate value, $2,900 each; estimated gross tonnage, 250.

One covered lighter for Atlantic Transport Co., Baltimore, Md.; length over all, 92 ft.; approximate value, $4,000; estimated gross tonnage, 350.

One open lighter for M. W. Adams, Baltimore, Md.; length over all, 85 ft.; approximate value, $3,000; estimated gross tonnage, 250.

J. H. Paine & Son, Inc., Noank, Conn.:

Two compound engines, 12 in. and 25 in. by 16 in. for a tug now building.

ITEMS OF INTEREST.

A measure was recently proposed in the German reichstag which proposes that the life of a German battleship be shortened, the present limit of service, 25 years, being reduced to 20.

The Clifton Motor Works, Cincinnati, O., report that they are building a great many engines, varying from 3 to 45 H. P., to be delivered during the coming year. Quite a number of these engines are contracted for.

The fleet of the Joy Steamship Co., including the steamers Tennessee, Kentucky, Fairfield, Edgemont, City of Key West, Seaboard and Kennebec, has been formally turned over to the United States Transportation Co., a part of the New York, New Haven & Hartford Railway system.

On May 1, 1908, the Hamburg-American Steamship Co. will remove its offices from their present location at 35-37 Broadway, New York, to the building which has been acquired by that company at 41-43-45 Broadway, formerly known as Aldrich Court, and in which extensive alterations are now in progress preparatory to occupation by the steamship company, which will have there the finest offices of any steamship line in the city.

The Bishop of London's visit to Canada reminds the Toronto *Saturday Night* of a former Canadian bishop who, possessed of a broad Scotch dialect, had a belief that it was not perceptible. A brother Scot called to see him one day, and the bishop asked him:

"Hoo lang hae ye been in Canada?"

"Aboot sax years," was the reply.

"Hoot, mon!" exclaimed the bishop, "why hae ye na lost your accent like mysel'?"

The Red Star liner Kroonland, which left Antwerp early in December for New York, arrived there only last week, without either passengers or cargo. This odd circumstance was the result of her having sustained a broken shaft while passing the entrance to the English channel, Dec. 8. She put in at Southampton, transferred her passengers to the White

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Star liner, Majestic, and went into dry dock to have another shaft fitted.

The Pacific Coast Steamship Co., San Francisco, Cal., is having plans prepared for a new 22-knot express and passenger turbine steamer for the Port Los Angeles route, which is to be on the same lines as the turbine steamers Yale and Harvard, recently running from New York to Boston. The plans are being prepared under the supervision of George W. Dickie, superintendent of construction for the company, and it is hoped that the result will be a steamship far in advance of any ever seen on that coast.

Within the next two months the navy department is expected to ask for bids for supplying additional coal for delivery on the Pacific coast, to be used by the battleship fleet while in those waters and on the return journey, as well as to maintain the normal coal supply at the various stations there. It is sincerely to be hoped that the American ship will be allowed an opportunity to benefit by the carriage of this commodity in accordance with the laws of the country for the consumption of whose navy it is designed.

The West Coast Steamship Co. has been organized at Los Angeles, Cal., to enter into competition with the Pacific Coast Steamship Co. on the routes between Puget Sound and San Francisco, and from San Francisco to San Diego. C. G. Krueger, of San Francisco, formerly of the Rock Island railroad, is manager of the new company. From three to six steamers, weekly, will operate each way, these to be fine new vessels designed for the combined freight and passenger service.

Although 40 miles from navigable water, the University of Michigan boasts a club of sufficiently nautical title and intent. It consists of students in the department of marine engineering and is known as the Quarter Deck Club. The following officers were elected, Nov. 12: Commodore, Leon H. Johnson, Jamestown, N. Y.; vice commodore, August W. Kretzschmar, Detroit, Mich.; secretary, Charles S. Wiley, Oswego, N. Y.; treasurer, Harry A. Musham, Chicago, Ill.; librarian, Floyd A. Rowe, Battle Creek, Mich.

Rear Admiral Evans, commander-in-chief of the Atlantic fleet, in issuing the formal orders giving the itinerary of the fleet on its voyage to the Pacific, includes the directions for forwarding mail to the officers and members of the crews. From Dec. 16 to Feb. 5, the mail for the fleets is to be sent in care of the postmaster at New York, and after that date in care of the postmaster at San Francisco. From the time the vessels leave Rio Janeiro until they reach Callao on the west coast of South America it will be impossible to get mail to them from the United States.

The Southern Pacific Co.'s new turbine steamship Creole has recently completed a successful voyage after her overhauling, which was made necessary from the fact that the steamer failed to attain her contract speed in service. For this reason the steamer was returned to the yard of the Fore River Ship Building Co., Quincy, Mass., where she was built and she comes from there with a guarantee of 16 knots. The Creole is 440 ft. long, 53 ft. wida and accommodates 196 cabin and 500 steerage passengers.

The Hamburg-American Steamship Co. has purchased the rights for the Schlick gyroscopic apparatus, and it is their intention to equip their small North Sea and English channel boats with it. It is expected that they will be kept steady in the roughest weather. The first vessel to be so fitted will be the Silvania and the order for building one of the new machines has already been given to the Vulcan Iron Works at Stettin, Germany. The gyroscope will be put in the stern and it is expected that it will entirely counteract the rolling or side motion of the vessel.

Protests are being made by the captains of vessels entering the port of New York against the restricted usage of the new Ambrose channel, through which only the very largest vessels are permitted to pass. Already there have been several instances of a steamship having entered which was not of the class designated, and as a consequence there are cases against their owners in the United States district court. This offense is a misdemeanor and is punishable by a fine not exceeding $500 and the imprisonment of the guilty skipper or pilot for not more than six months.

The 25-ft. water line cruising yawl Kittiwake, owned by Reginald H. Johnson, of Boston, has been sold through the agency of Hollis Burgess to Royal B. Curtis, of New Rochelle, N. Y. The cruising yawl Aspinet, owned by Henry S. King and Stanley M. Bolster, of Dorchester, Mass., has been sold through the same agency to Ernest G. Adams, of Worcester, Mass., also the 21-ft. knockabout Jester, owned by Dr. Ernest B. Young, of Boston, to W. J. Aylward, of Boston, the 18-ft. knockabout Mustang, owned by H. B. Buck, of Boston, to Benjamin Franklin Jr., of Providence, and the fast sonderklasse sloop Windrim Kid, owned by Frank G. Macomber Jr., of Boston, to Dr. Joseph T. Cox, of Penn Yan, N. Y.

BOOK REVIEWS.

Lumber Carrying Steam Schocners, Owned in San Francisco, is the title of an interesting list which has been compiled by the Ship Owners' Association of the Pacific coast, Ferry Post Office building, San Francisco, Cal., and which is being distributed to the marine trade for the sum of 50 cents.

The list gives the name, gross tonnage, net tonnage, capacity, M. ft., length, beam, depth, size of engines, kind of boilers, fuel, indicated horsepower, when built, number of engineers, firemen, oilers and stewards, together with the name of the owner, of all lumber-carrying steam schooners owned in that city.

In addition to this there is a summary, embracing the principal features of the report and also an alphabetical list of owners, and the vessels which they own.

A Sailor's Garland a collection of poems selected and edited by John Masefield. New York. The MacMillan Co. 328 pages. Supplied by the MARINE REVIEW for $1.50.

This should prove a very interesting book to those who love the sea and its people, as between its covers have been collected the gems of poetry which sing the songs of the deep, including excerpts from William Shakespeare, Chaucer, S. T. Coleridge, William Cowper, Lord Macauley, Charles Kingsley, Robert Browning, Lord Byron, Lord Tennyson, Frederick Marryat, Rudyard Kipling, Walt Whitman, Henry W. Longfellow, A. T. Quiller-Couch, and many others.

In addition to these there is a chapter devoted to chanties—the songs which the sailors sing while engaged in their labors, or at least which they used to sing quite regularly before the advent of steam—and of which many are of very ancient origin.

Sea Terms and Phrases, English-Spanish, Spanish-English, by Graham Hewlett, fleet paymaster, royal navy. London. Charles Griffin & Co. Philadelphia. J. B. Lippincott Co. 3 x 4¼ inches. 368 pages. Supplied by the MARINE REVIEW for $1.25.

This should prove a most interesting and useful little volume to those who, either in naval or merchant service, find it necessary to communicate with the Spaniard or with those ubiquitous peoples who, having long since ceased to owe allegiance to the mother country, have yet continued to speak her language.

Many valuable features besides the sea terms themselves appear, including a glossary of geographical names, tables of animals, birds, fishes, plants, fruits, etc., papers of a Spanish merchant ship, tonnage certificate and bill of health, as well as tables of the relative ranks of the officers of the Spanish and British navies.

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A feature which will commend the work to those people ashore who have to struggle with Spanish correspondence is the inclusion of several pages on this subject, covering the proper forms of addresses, salutations and terminations. Altogether a very attractive and valuable compendium.

IMPROVING CHICAGO'S LAKE FRONT.

Lieut. Col. W. H. Bixby, government engineer, under date of May 22, 1906, made a report upon Chicago harbor which is quite pertinent to the present movement projected by Mayor Busse to prevent the park commission from taking entire possession of the strip of lake front extending from Twelfth to Fifty-sixth street, as noted in the MARINE REVIEW of Jan. 9 last. After discussing the fact that protests against the flow of water through the Chicago river for sanitary purposes by vessel interests were really against a feared impending danger rather than a trouble actually realized, he says:

But if complaints have been urgently presented in the past at Chicago with an allowed flow of 4,167 cu. ft. per second, there is no doubt but that further and numerous complaints must be expected when the total volume of flow shall be doubled, although the velocities to be met by a single boat passing through any unobstructed portion of this river in future years will still be very small, owing to the new clear widths and clear depths being so great as to make the new cross section of the river at constricted places more than double the old cross section. Future trouble in the Chicago river, due to the currents caused by the drainage district diversions, will be due not so much to the actual volume of water passing as to the fact that the public expects from the Chicago river today the performance of three entirely different functions, viz., (a) service as a sewer to carry off water freely, (b) service as the main wharfage area or principal dock or slip of Chicago harbor, and (c) service as a canal for free passage of boats from one end of the harbor to the other, including probably, in a few years, service as the most important portion of the through canal or water route from Lake Michigan to the Illinois and Mississippi rivers. The Chicago river, even after enlargement to 200 ft. width and 26 ft. depth, according to the present plans of the sanitary district, will have all it can do to properly fulfill either one of the above functions alone, and it can not reasonably be expected to properly fulfill any two of such functions, and much less to fulfill all three together.

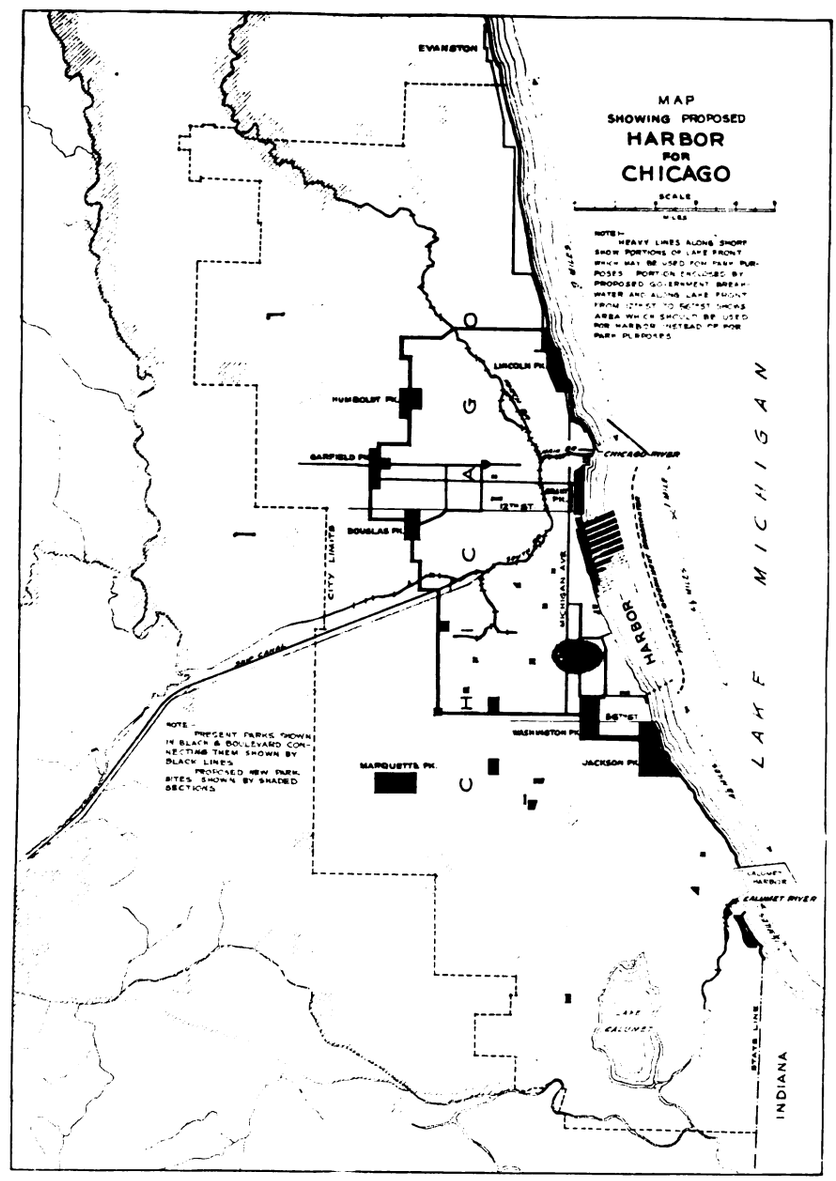
After discussing the flow necessary for drainage purposes, he says:

I can see no use of Chicago river as a harbor or place for wharf frontage unless boats can stop and tie up somewhere, nor unless they can pass each other to get to their place of wharfage, and on a stream like Chicago river the wharf owners on each side of the stream must be entitled to equal privileges. This means that there should be room for one boat to tie up on each side of the river and room for at least a third boat to pass.

The Chicago boat owners claim that the Chicago commerce has been seriously crippled because the tunnels prevented passage of boats drawing over 16 ft.; that boats less than 45 ft. beam are going out of existence on the great lakes, and that Chicago harbor must provide future facilities for boats of 45, 50 and even 60 ft. beam. I therefore assume in the following discussion that the advantageous use of Chicago river by boats must require preparation for boats of from 40 ot 50 ft. beam and 800 sq. ft. of wetted cross section when loaded. A mere dock or boat slip of three or four boats' length (say 2,000 ft.) should, for advantageous use by 50-ft. beam boats, have a clear width of 175 ft. if straight, and 200 ft. if at all curved, to allow of a boat tied up on each side and of one boat at a time entering or leaving the slip, allowing a few feet between them for free motion; but if the boat slip be more than 2,000 or 3,000 ft. in length, it should, for safety of navigation and economy of time, be 50 ft. wider, so as to allow of four full-sized boats abreast, two at wharves and two passing in mid-stream.

As Chicago river, south branch, including its west fork up to the drainage canal entrance, is about 5.57 miles long and only 200 ft. wide, and not straight, it is at present not wide enough for use as a boat slip or harbor for 40 to 50-ft. width boats, except in alternate sections of half-mile lengths, and it can not advantageously be used even in that way for harborage purposes, except by boats of less than 40-ft. beam. Even then, as soon as one boat ties up at a wharf and a second boat tries to pass it, the current velocity in the south branch, with 8,000 cu. ft. per second drainage flow, is liable to increase to 1.8 miles per hour (2.6 lin. ft. per second), and when three boats are abreast the current is liable to increase to 2.4 miles per hour (3.5 lin. ft. per second). With four boats abreast the current is liable to reach 3.6 miles per hour (5.3 lin. ft. per second).

After discussing the limitations imposed upon the Chicago river as a navigable stream and the necessities of sanitation, he says that only three remedies present themselves—first, to limit the flow; second, to widen the river, and the third, to move the Chicago harbor out of the river into the lake. The first, of course, would lessen the efficiency of sanitation, the second is practically impossible owing to the high price of river bank property, the third he believes to be the proper place for the harbor and can be developed there in a practical manner at little cost.



The Great Northern railway has prepared plans and specifications for a great elevator to replace Elevator A which was burned in the early part of November at Superior. It is intended to make it the largest single grain elevator in the world with a capacity of nearly 4,000,000 bu.

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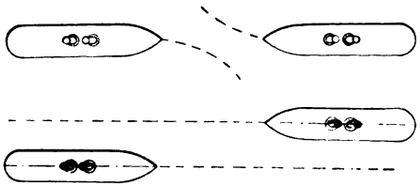
ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

307. The following diagrams are the answer to question 307:



308. The steamer which has the other on her own port side shall hold her course and speed. This is the same thing as the old rule: when to starboard red appears it is your duty to keep clear—port and go astern.

309. The one steering N E. The steamer steering N W has the right of way by the rules but she gave up her rights when she answered with two blasts. If she did not want to give up her right of way she would be required to sound an alarm signal and then one blast of the whistle and the other should answer.

310. The one steering N W would naturally starboard, though if in very close quarters, stop and back.

311. Would sound an alarm and blow one blast. The other would answer, and if necessary put her helm to port and go astern of the other while the other would hold her course and speed.

312. In this situation the two steamers are so far apart that the one to port, which in close quarters must keep out of the way, may cross first, after giving necessary signals, and receiving the assent of the steamer to starboard.

313. One steamer is overtaking another. The overtaking steamer may pass on either side of the steamer ahead after the necessary signals for passing are given and answered properly.

314. Starboard and port helm; red and green lights and one and two blasts of the steam whistle.

315. The one that has the other on her own starboard side.

316. Yes.

317. The statute mile is an arbitrary measurement. It contains 5,280 feet. It was so fixed by law and has no connection with a scale of nature.

318. 5,280 feet.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

345. You have run 123 miles by log (knots), how many statute miles have you run?

346. How many feet in 7 statute miles?

347. How many feet in 12 nautical miles?

348. What is a true course?

349. What is a correct magnetic course?

350. What is the difference between a true course and a correct magnetic course?

351. If you apply the variation to a true course, what kind of a course do you get?

352. What is the difference between a correct magnetic course and a compass course?

353. What is variation of the compass?

354. How many kinds of variations are there?

355. How does the variation get its name?

356. What is deviation?

QUESTIONS FOR MASTERS AND MATES.—NO. 55.

726. Why is it that the compass works so much more sluggish on Lake Superior than the other lakes?

727. What is the amount of the dip on Lake Superior?

728. Compared with the other lakes how much less is the horizontal force on Lake Superior?

729. Why is the heeling deviation greater on Lake Superior for the same heel than on the other lakes?

730. What is the mean variation between Passage Island and Whitefish Pt.?

731. What is a drag, how constructed and what used for?

732. On a lee shore in a heavy gale of wind your steering gear became disabled, what would you do?

733. How many feet to a knot on a log line based on the statute mile?

734. How many feet if based upon the length of the nautical mile?

735. How do you place ship's head correct magnetic by pelorus?

736. How would you do it without azimuths?

737. How do you separate quadrantal from semi-circular deviation?

RISDON IRON WORKS.

The Risdon Iron & Locomotive Works, San Francisco, Cal., have in hand considerable work. The company is supplying a triple-expansion engine, 13, 21 and 34 in. cylinder diameters by 24-in. stroke, supplied with one Risdon water-tube boiler, 2,200 sq. ft. heating surface and one vertical donkey boiler 5 ft. in diameter and 8 ft. high for the steamer Wm. H. Murphy, building for the Pacific Lumber Co. The hull of the steamer, which is 206 ft. long, 39 ft. beam, and 14 ft. deep, is being built by the Matthews Ship Building Co., Hoquiam, Wash. The company is also building a triple-expansion engine of the same dimensions for the steamer Clermont, owned by the Hart-Wood Lumber Co., San Francisco. The hull of the steamer, which is 187 ft. long, 38 ft. beam and 13 ft. 6 in. deep, is being built by the Lindstrom Ship Building Co., Aberdeen, Wash. They are also supplying two high-pressure condensing engines 18-in. cylinder diameters by 72-in. stroke, supplied with two dry back boilers 18 ft. 6 in. diameter and 16 ft. long for the stern-wheel steamer Hercules owned by the E. I. DuPont de Nemour Powder Co. of New York. The hull of this steamer which is 160 ft. long, 36 ft. beam and 7 ft. deep, is being built by the Pacific Ship Yard & Ways Co., Alameda, Cal. The Risdon Iron Works are also building a clam-shell dredge for the trustees reclamation district for use on the Sacramento river. The hull is of wood, 130 ft. long, 61 ft. beam and 13 ft. deep, equipped with a boom 170 ft. long and a bucket 5 yds. capacity. The installation is very complete without, including electric light plant, steam capstan, etc.

LAUNCHING THE B. F. BERRY.

The steamer B. F. Berry, building for the Fremont Steamship Co. of Detroit, which was organized by H. K. Oakes, was launched from the Lorain yard of the American Ship Building Co. on Saturday last and was christened by Mrs. B. F. Berry in honor of her husband. The Berry is 569 ft. over all, 549 ft. keel, 56 ft. beam and 31 ft. deep. She has 34 hatches spaced 12-ft. centers. Her engines are triple-expansion with cylinders 24, 39 and 65 in. diameters by 42-in. stroke, supplied with steam from Scotch boilers, 15 ft. 4 in. diameter by 11 ft. 6 in. long, equipped with Ellis & Eaves draft and allowed a working pressure of 180 lbs. She will carry 10,000 gross tons of ore.

Among those who attended the launching were R. E. Collins of Detroit, Mr. and Mrs. F. J. Sullivan of Cleveland, Mr. and Mrs. Alexander Hynd of Cleveland, S. J. Bolwing, Mr. and Mrs. James Nacey of Cleveland, R. Chalmers of New York, E. J. Earling of Milwaukee, J. A. Curtis of Detroit, D. Sullivan of Chicago, H. K. Oakes of Detroit, John Walsh of Detroit, Victor Breslin of Detroit, and Mr. and Mrs. C. D. Jury of Cleveland.

Capt. Dennis Sullivan of Chicago will manage the steamer.

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THE THEORY AND PRACTICE OF LAKE NAVIGATION

BY CLARENCE E. LONG

MOVEMENTS OF THE EARTH AND SUN.

INCLINATION OF THE EARTH'S AXIS.

As the earth travels around its orbit, the axis always points in nearly the same direction. The axis is not perpendicular to the orbit; it leans, or inclines, about 23½° from the perpendicular, as shown in Fig. 1.

Diagram or Fig. 1, represents the earth at four points in its orbit around the sun. In its position of March 21 the sun at noon is on the equator. Each day as the earth advances in its orbit, the inclination of the axis causes places far-

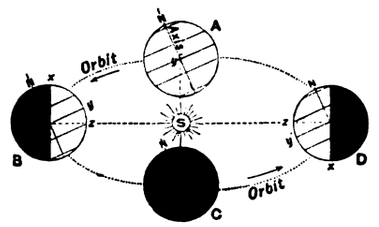

FIG. 1.

ther and farther from the equator to be presented to the vertical rays of the noon sun, until June 21, the sun at noon is in the zenith or vertically over z, which is as far from the equator as the north pole, N., is distant from x; that is 23½°, or the angle of inclination of the earth's axis, or the number of degrees it is out of plumb with the plane of the ecliptic, which is represented by a straight line drawn from the center of the sun to the center of the earth.

Note.—If you do not thoroughly understand what this means try the following simple experiment: Stick a knitting needle through the core center of an apple or an orange (get one as round as possible), and let the ends protrude above and below. The knitting needle represents the poles and axis of the earth. Next take a piece of pasteboard and cut a circular hole in its center large enough so that the apple or orange will go through it. Now rest the ends of the pasteboard on a couple of books laid on a table in such a manner that the apple will have room enough below without touching the table. The piece of pasteboard must be level (horizontal). Place the apple in the hole of the pasteboard so that only one-half is to be seen on top and adjust it so that the end protruding above is at right angles, or 90°, from the sheet of pasteboard. The sheet of pasteboard represents the plane of the ecliptic, or a plane extending from the earth's center to the sun's center. If the earth's axis were exactly perpendicular to the plane of the ecliptic, as shown by your rude device, the days and nights would everywhere be of the same duration, from one end of the year to the other; there would be no seasons, and in fact, nothing. Now incline the needle ends to an angle of 66½° (as near as you can tell by the eye) with the sheet of pasteboard, or the ecliptic, which it represents; when you have done this shove another knitting needle through the apple's equatorial center from a position on top the pasteboard so that it will come out on the other side diametrically opposite and again rest on the pasteboard. The needle will now hold the apple in its place without further aid, and you can illustrate for yourself the precise manner in which the earth travels around the sun, and the manner in which the sun's rays strike the earth's surface, in which portions and the cause of the seasons, the sun's declination, etc.

As the earth passes around in its orbit, the axis assumes daily a position in relation to the sun more nearly similar to that shown of March in the diagram, and the earth presents to the vertical rays of the noon sun points nearer and nearer to the equator, until, in September, the sun is exactly over the equator again. Through the other half of the orbit the same phenomena takes place, but on the other side of the equator. Thus, the only part of the earth which ever receives the vertical rays of the sun lies between the parallels of 23½° latitude on either side of the equator; hence, these parallels are taken as the limits of the hottest or "torrid" zone. The parallel on the north is called the tropic of Cancer, and the one on the south the tropic of Capricorn. They are called tropics (turnings), because over them the sun appears to turn and retrace its course toward the equator. It will be observed in the diagram that when the earth is at December or June the region within 23½° of one of the poles is in darkness, and hence receives no light or heat during an entire rotation of the earth. These regions, which, during at least one day of the year receive no heat rays, and during the rest of the year receive them only very obliquely, must be the coldest parts of the earth; hence, the parallels of 23½° from the pole, or in latitude 66½°, are taken as the limits of the frigid zones. The polar circle near the north pole is the Arctic Circle; that nearest the south pole is the Antarctic Circle.

It is because of this inclination of the earth's axis that the hours of sunrise and sunset change from day to day, and that one-half of the year is warmer than the other half. This inclination never changes. It is the annual revolution of the earth and the inclination of the axis that causes the change of the seasons.

EXPLANATION OF FIGURE 1.

C is the position of earth in its orbit, or path, at about March 21 (spring, or vernal equinox). With the earth in this position the declination of the sun is zero; in other words, the sun is directly over the equator, and its light shines from the north pole to the south pole, hence the day and night for this position is equal all over the world. On this date for an observer situated on the equator the sun would appear to describe in the sky a great circle like the equator itself. The sun rises in the true east at 6 o'clock true time. It ascends vertically and continues to bear true east until it reaches the zenith—directly overhead—of your meridian. From this position it descends describing the same great circle but bears true west until it sets at 6 o'clock. Only to the equator does the sun describe this great circle. Although, at all other places on the earth the day and night is of equal length, 12 hours of each, the sun rises and sets in the true east and west at 6 o'clock true time, but it travels at a less altitude across the sky. The higher the latitude, that is, the greater the distance from the equator, the smaller arc it will describe in the sky, or the closer it will hang to the horizon. For an observer at either pole on this date he would see the sun following along his horizon at the same height from its time of rising till time of setting. Theoretically, he would only see one-half the sun's disk, while an observer at the opposite pole would see the other half. The observer at the north pole would observe the upper half and the observer at the south pole, its lower half. On the equator at high noon (meridian height) the sun's altitude would be 90°. In our latitude, say 45°, the meridian height of the sun on that day would be 45°. We know how far north of the equator we are and the position of the sun, therefore, our latitude must equal the number of degrees the sun is above the horizon at noon for that day. Again, if we know how far we are from the sun and how far the sun is from the equator, we can easily determine our latitude. We have the altitude of the sun for three positions on the earth for that day, viz.: Equator or 0° lat. = 90° altitude; lat. 45° = alt. 45°; north pole, lat. 90° = alt. 0°.

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A is the position of the earth in its orbit at about September 21, or six months from its position at C. This is called the autumnal equinox. The same conditions prevail when the earth occupies this position as when at C—equal day and night all over the world. The declination of the sun is nothing, but the sun is bound south instead of north as at C. For the position at A our fall and winter is coming on. At C the sun is bound north, and our spring and summer begins. At A we see the half of the earth the sun shines upon. At C we see the half in darkness. Remember, that the earth in these two positions experiences the same phenomena relative to the sun, the orbit, the plane of the ecliptic, etc.

B is the position of the earth in its orbit at about Dec. 21, or winter solstice. The sun reaches its greatest south declination—23½°. The earth in its orbit at this season of the year describes a smaller arc of the ellipse in which it revolves, and as the earth's axis is inclined to the plane of the ecliptic always by the same angle, its full amount is here experienced, since the axis in retaining this same inclination must bring one of the earth's poles closer to the sun and the other farther away. This is easily seen for in drawing a line to meet a horizontal line at an angle of 66½°, the line first drawn is considerably tilted. The tilted line represents the earth's axis, and as the sun can only shine upon one-half of the earth at a time, the tilted portion must be either in the light or the dark of the sun, depending upon the position of the earth in its orbit. zz is the plane of the ecliptic and shows where the perpendicular ray of the sun strikes the earth. The dotted line y'' represents the same thing. In the one case it coincides with the equator, and in the other case 23½° below the equator.

D is the position of the earth at the summer solstice, about June 21, declination 23½° north. z to y' in D is the arc of the angle of the sun's declination on or about June 21, being then in its extreme limits. The declination is north because the plane of the ecliptic is north of the earth's equator. In the winter solstice, B, the conditions are actually reversed, though the angle of the declination is of the same amount but opposite in name, being south, z to y. In the spring and autumnal equinoxes, A and C of diagram, the sun's declination is 0° because there is no angle between the plane of the ecliptic and the equator, that is, a line drawn directly from the sun's center, at these times of the year, will strike the earth's equator, and they will be as one; at all other times such a line would strike north or south of the equator, hence the term declination.

Remember that the sun illuminates just one-half of earth each day, but this half of the earth is not from pole to pole. Only twice in the year does this occur. Whatever number of degrees the sun's light falls short of one pole its lights show the same number of degrees beyond the opposite pole.

The dotted line in Fig. 1, marked orbit, is an ellipse. The importance of the ellipse arises from the fact that all the planets move in elliptical orbits, the sun being in one of the foci.

LENGTH OF DAYS AND NIGHTS.

Owing to the inclination of the earth's axis, there are but two points in the orbit where the light of the sun reaches both poles of the earth at the same time. These two points, March and September, are called equinoxes (equal days), for when the earth occupies either of these positions in its orbit, the days and nights are everywhere of equal length. At all other points in the orbit, except March and September, the light of the sun extends beyond one pole, but fails to reach the others. As a result, more than half of the one polar hemisphere is illuminated, and its days are longer than its nights, while less than half of the other hemisphere is illuminated, and consequently in that hemisphere the days are shorter than the nights.

By referring to the last diagram, and remembering that the earth is constantly rotating upon its axis as well as moving around the sun in its orbit, it will be seen that the days and nights are always of equal length (12 hours) at the equator, but at all other places they are of unequal length, excepting when the earth is at the equinoxes. The days are shortest in the northern hemisphere and longest in the southern when the earth is at December. The reverse is the case six months later when the earth is at June. At these positions, called solstices, it is continuously day at one polar circle, and continuous night at the other, during a complete rotation of the earth, or 24 hours, while at the poles it is either continuous day or continuous night while the earth is passing from March to September, or for six months.

THEORY OF THE SEASONS.

The succession of the seasons depends upon the revolution of the earth, together with the inclination of the axis. When the earth is in the position of March 21 in diagram, it is the spring or vernal equinox, and the days and nights are everywhere of equal length. As the earth moves forward in its orbit, the north pole begins to incline toward the sun, the days lengthen in the northern hemisphere and shorten in the southern; and, since the sun reaches the zenith of points north of the equator, the heat increases in the northern hemisphere while the cold increases in the southern. After 92½ days, or about June 21, the sun reaches the zenith of the tropic of Cancer. This is the summer solstice in the northern hemisphere, which receives the sun's rays most perpendicularly, and the winter solstice in the southern hemisphere, upon which the sun's rays fall most obliquely. As the earth advances, the sun day by day reaches the autumnal equinox, about Sept. 22. This is the beginning of spring in the southern hemisphere. Moving onward, the earth gradually presents its southern pole to the sun, while the north pole enters its annual period of cold and darkness. For 90 days the days in the northern hemisphere grow shorter until the winter solstice is reached about Dec. 21. This is the summer solstice, however, in the southern hemisphere, the time of its longest day and most direct exposure to the sun, which reaches the zenith of the tropic of Capricorn. Passing on from this point in its orbit, the earth gradually withdraws its south pole from the sun until after 90 days, it reaches the position of the vernal equinox again.

It may be interesting to know that in the northern and southern hemispheres the duration of summer is not the same. The northern is the longer of the two, since the sun is on our side of the equator for 186¼ days, and to the southward of it for the remaining 178¾ days. This is due to the eccentricity of the earth's orbit, and the fact that we move in it faster when near the sun (our winter) than we do when further away (our summer).

SIGNS OF THE ZODIAC.

The earth advances 30° every month of the signs of the Zodiac, which causes the sun apparently to do the same in the opposite sign. The Zodiac represents that path in the heavens which the sun seems to describe by the earth's revolution around it. A sign is a portion of the ecliptic containing 30°, or the 12th part of a circle. The first of the 12 signs commences at that point of the ecliptic through which the sun passes at the period of the vernal or spring equinox—the signs are counted from west to east. A belt in the heavens extending 8° on each side of the ecliptic is called the Zodiac, hence the term, "Signs of the Zodiac." Their names, and the order in which they follow each other, are as follows:

NORTHERN SIGNS.

Aries—the Ram.
Taurus—the Bull.
Gemini—the Twins.
Cancer—the Crab.
Leo—the Lion.
Virgo—the Virgin

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SOUTHERN SIGNS.

Libra—the Balance.
Scorpio—the Scorpion.
Sagittarius—the Archer
Capricornus—the Goat.
Aquarius—the Water bearer.
Pisces—the Fishes.

The signs derived their names from the 12 constellations of the Zodiac.

The various figures or groups of stars which form these constellations, representing a ram, a bull, a crab, etc., originated with the ancients, and is as imaginary as the man in the moon. These animals are invisible no matter how much one may twist his neck in looking for them. It is better at once to chuck overboard these fantastic figures as so much imaginary rubbish, for that is all it amounts to.

A constellation is a group of fixed stars, bearing the name of some animal or emblem.

Rest in nature seems to be impossible. We on earth know, by astronomical every-day teaching, that our globe and the other planets continually circle around the sun as the center of this particular system; yet it is seldom brought home to our minds that the sun himself, with all his following, is speeding through space just as the other fixed stars (the stars are supposed to be suns like our own, and perform the same duty) are doing—some at the enormous rate of 300 miles a second. The question of the exact position of the point in the heavens towards which the sun with its system is traveling, has been the subject of much research and computation.

The ecliptic is the apparent annual path of the sun in the heavens.

The obliquity of the ecliptic is the angle between the plane of the equator and that of the ecliptic, now about 23° 27′ but diminishing at the rate of about 46.3″ a century.

The ecliptic is also defined as that plane passing through the center of the sun, which contains the orbit of the earth. Called also the plane of the ecliptic. The great circle in which this plane intersects the celestial sphere, or the apparent path of the sun around the celestial sphere.

Bear in mind that the inclination always remains the same, but that it is the shape of the ecliptic that does the work.

INFLUENCES OF THE EARTH'S MOTIONS.

The earth revolves constantly around the sun, and at the same time rotates upon an axis inclined 23½° towards the plane of its orbit. In consequence of the inclination of the axis, the declination of the sun, or its angular distance from the equator, varies with the advance of the earth in its orbit, causing periodical variations in the length of day and night, and, consequently, in temperature.

POSITIONS OF THE VERTICAL SUN.

On March 21 (vernal equinox) and Sept. 22 (autumnal equinox) the midday sun is vertical at the equator. Rising directly in the east it ascends the heavens to the zenith, and, descending, sets directly in the west. The illuminated hemisphere extends from pole to pole, and embraces half of every parallel of latitude; hence every point of the earth's surface is under the rays of the sun during half of the diurnal rotation; the days and nights are equal all over the globe. When the earth occupies this position in its orbit the sun not only rises and sets at exactly 6 o'clock apparent time on the equator, but all over the globe as well. At all other times the sun rises and sets to the northward and southward of east and west, and its time is either before or after 6 o'clock, depending on the season. On the equator the sun rises and sets at exactly 6 o'clock, true time, throughout the year, but it must not be understood from this that the sun rises and sets exactly east and west, for it does not. From March until September the sun rises and sets to the northward of east and west in north latitude, reaching its greatest northerly bearing on June 21. Just the opposite effects take place between September and March, the sun at rising and setting reaches its most southerly bearing on Dec. 21.

The tropics, situated 23½° from the equator, mark the highest latitude which receives vertical rays of the sun. Their position is fixed by the inclination of the earth's axis 23½° towards the plane of its orbit. On June 21 the vertical sun, in its diurnal course, passes over every point on the northern tropic; on Dec. 21, over every point on the southern. Twice in the year it passes, in succession, over every parallel between the tropics; from June to December advancing southward, from December to June, northward.

The ecliptic is a great circle whose plane coincides with that of the earth's orbit, and consequently intersects the plane of the equator at an angle of 23½°. It marks the apparent path of the vertical sun from tropic to tropic during the annual revolution of the earth. The ecliptic bisects the equator, and touches the two tropics in opposite latitudes, and on opposite meridians. See diagrams.

The diagram above shows the position of the north pole with respect to the edge of the sun-lighted half of the earth each month in the year. When the sun is vertically over the equator the sunlight extends to the same distance on both sides of the equator, or to both poles. As the earth rotates in this position the sun rises and sets at 6 o'clock, and the days and nights are everywhere of equal length. The days and nights are always of equal length on the equator, but elsewhere, except at the equinoxes, they are never equal. When the earth passes either equinox, the poles gradually recede from the sunrise and sunset line for three months, and then approach and reach it again three months later at the other equinox. Thus, at the poles there are six months of continuous daylight, followed by six months of continuous darkness.

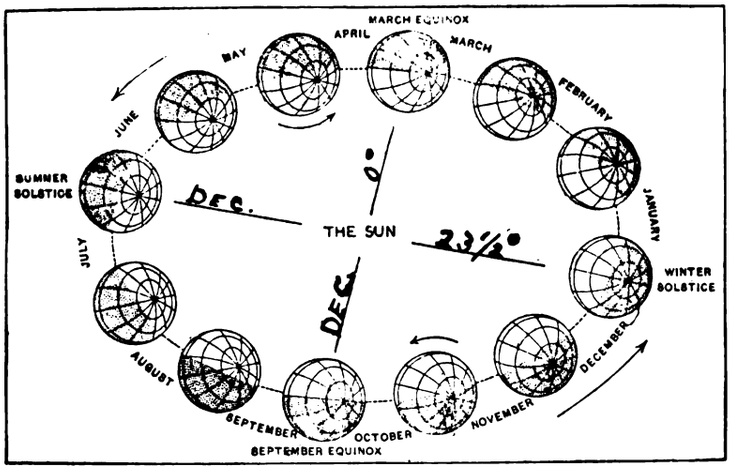

FIGURE 2.

Note that at March and September the north pole in each case receives the sun's light. From that time on the north pole is either in the light or dark. From March to June the sun's light illuminates more and more of the arctic pole region, and on June 21 throws its light the farthest beyond the pole. The sun's light reaches the pole about March 21, and from that time onward increases its distance a fraction of a degree each day, till June 21 its sum is 23½°, that is 23½° beyond the north pole, or latitude 66½° north. In other words, it has been continuous day at the north pole all this time and then beyond the pole until June 21, when all places within the arctic cir-

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cle, or 23½° from the pole, have had continuous day—the sun being seen all day in every point of the horizon. On June 21 it is continuous day as far south from the pole as the arctic circle.

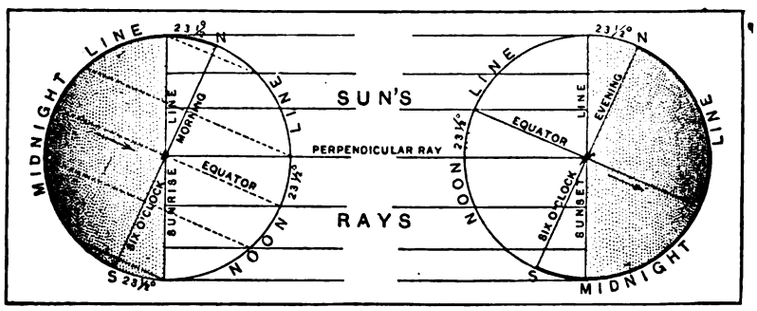
Now, what is the cause of this? It is due to the fact that the earth's axis is inclined to the plane of the ecliptic at an angle of 23½°, and that in its revolution around the sun its path is elliptical instead of a true circle. The sun always throws its light from the same relative position, that is to say, it is not the shifting of the sun that is in anyway responsible for the variable manner in which the sun's light illuminates the earth. From the March equinox, when the plane of the ecliptic, or a straight line from the center of the sun to the center of earth coincides with the equator, the north pole axis, in retaining its constant angle of inclination with the plane of the ecliptic, must tip forward, or toward the sun, in moving along its elliptical path. The farther it goes from the March equinox the more the axis tilts, because the arc of the ellipse over which it moves, becomes smaller. From the March equinox to the summer solstice the axis tips 23½°, which causes the sun's light to shine beyond the pole and causes continuous day as far as the light rays reach. It must not be understood that because the earth's axis is inclined to the plane of the ecliptic by an angle of 23½°, that it is from this cause alone that the poles tip toward and away from the sun in its annual revolution. It is the elliptical path in which it travels as well as the inclination of its axis.

About June 21.

About Dec. 21.

The angular distance from the equator to where the vertical ray of the sun strikes the earth's surface is the sun's declination. It is also the angular distance that the sun's light shines beyond or falls short of either pole. Supposing the vertical ray from the sun shone on the earth at 10° north of the equator. The sun's declination is 10° north because this is its angular distance from the equator. The sun would be directly overhead at noon for an observer on the parallel of 10°. As the sun's direct ray is north of the equator, the season is our summer, and as such, the sun's light must shine beyond the north pole—10° beyond it. In other words, it is continuous day from the pole to the 80th parallel, or vice versa. For an observer situated anywhere on the 80th parallel would observe the sun on its horizon for 24 hours. If the sun's declination were increasing it would appear higher to him thereafter, and if diminishing he would only see its shadow during the 24 hours following, or its twilight.

Twilight is the light perceived before the rising, and after the setting, of the sun, or when the sun is less than 18° below the horizon, occasioned by the illumination of the earth's atmosphere by the direct rays of the sun and their reflection on the earth.



About June 21. About December 21.

FIG. 3.

EXPLANATION OF FIG. 3.

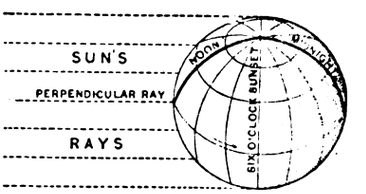
About June 21 the north pole is 23½° within the lighted hemisphere; the perpendicular rays of the sun fall on places 23½° north of the equator. As the earth rotates in this position, the sun rises and sets at 6 o'clock at the equator, and the days and nights there are equal, but the sun rises earlier and earlier at places nearer and nearer to the north pole, and later and later at places nearer and nearer to the south pole; hence in the northern hemisphere the days are longer than the nights. About Dec. 21 the north pole is within the dark, and the south pole within the lighted half of the earth, while the perpendicular rays of the run fall on places 23½° south of the equator.

Fig. 3 shows the positions of the earth in its orbit at the summer and winter solstices. These positions show the extreme limits of the sun's declination—one north and one south. Note the manner in which the sun's perpendicular ray strikes the earth, and the positions of same. This perpendicular ray may be taken as the plane of the ecliptic, for a straight line from the sun's center to the earth's center is nothing more. Wherever the sun's vertical or perpendicular ray occurs, the sun at noon is in the zenith of that parallel of latitude, or in other words, the sun's altitude is 90°. In either of the above positions the earth is at the turning point of its orbit. From June to December the earth in presenting and withdrawing its north pole to and from the sun, changes the vertical ray of the sun over the earth's surface, twice 23½°, or 47°. From the June turning to the September equinox the north pole in withdrawing from the sun changes its position by 23½°, due to the obliquity of the ecliptic, or from the fact that the earth's path is irregular in its shape. At the September equinox the plane of the ecliptic and the plane of the equator coincide, or the earth is in that position in its orbit that its obliquity is a minus quantity. From September to December the obliquity of the ecliptic is such that the earth's axis is again thrown out of line in addition to its constant angle of inclination. It turns its north pole away from the sun and presents its south pole to the sun. In the winter solstice the earth in its orbit merely retraces the movements it performed during the summer solstice.

It must be borne in mind that the ecliptic is the real path of the earth as seen from the sun, or the apparent path of the sun in the sky. It is the sun instead of the earth that appears to move. It is the rotation of the earth on its axis from west to east that is responsible for the sun's apparent movement across the sky from east to west.

The ecliptic, the earth's orbit or path, or the ellipse in which the earth revolves around the sun, are all one and the same thing; hence, do not become puzzled at the various expressions.

A careful study of Fig. 3 will make this all very clear. The line marked perpendicular ray with those marked equator measures the inclination of the earth's axis with the plane of its orbit, and also, why the inclination of the earth's equator to the plane of the ecliptic is responsible for the declination of the sun. This diagram also illustrates why the sun rises and sets on the equator always at 6 o'clock.



At the March equinox.

FIG. 4.

AT THE MARCH EQUINOX.

Showing the perpendicular ray of the sun coinciding with the equator. The intersection of the noon line with the per-

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pendicular line is the equator. For an observer at either pole would observe the sun on his horizon for the 24 hours of that date, in other words, the sun would not rise or set. The sun itself would be vertically over the equator, and its light just reaches either pole, which accounts for the sun being on the horizon for 24 hours. The same phenomena as above takes place about Sept. 21, at which time the declination of the sun is also zero.

INCLINATION OF THE EARTH'S AXIS.

FIG. 5.

HOMELY DEFINITIONS.

The geometrical word "plane" has been used many times in the foregoing pages, such as the plane of the ecliptic, plane of the earth's orbit, etc. Men who have not had the advantages of mathematical instruction sometimes fail to comprehend its meaning, and a reference to the dictionary leaves them as mystified as ever. In the

EXPLANATION OF FIG. 5.

Inclination of the earth's axis.—The absolute direction of the earth's axis at all points of the orbit, is nearly the same. This direction makes an angle of about 66½° with the plane of the ecliptic—a plane passing through the earth's orbit and the sun's center. The axis, therefore, leans about 23½° (90°—66½°) out of a perpendicular to the plane of the ecliptic. This angle constitutes the inclination of the axis.

CONTINUOUS DAY OR CONTINUOUS NIGHT.

Beyond the tropics the sun, in the hemisphere in which it is vertical, makes the entire circuit of the heavens, without sinking below the horizon, for a period varying from 24 hours to six months; while in the opposite hemisphere there is a corresponding period of continuous night.

THE LENGTH OF THE DAY AND NIGHT.

The following table gives the length of the longest day, excluding the time of twilight, and of the shortest night, in the different latitudes, with the difference of duration in hours and minutes, thus exhibiting more clearly the above law.

Latitude.	Longest Day.	Shortest Night.	Difference
Equator	12.0 hours	12.0 hours	0.0
10°	12.7 "	11.3 "	1.4
20°	13.3 "	10.7 "	2.6
Tropics	13.5 "	10.5 "	3.0
30°	14.0 "	10.0 "	4.0
35°	14.5 "	9.5 "	5.0
40°	15.0 "	9.0 "	6.0
45°	15.6 "	8.4 "	7.2
50°	1.63 "	7.7 "	8.6
55°	17.3 "	6.7 "	10.6
60°	18.7 "	6.3 "	13.4
Polar Circles	24.0 "	0.0 "	24.0
67½°	1 month		
69½°	2 months		
73.3°	3 months		
78.3°	4 months		
84°	5 months		
North Pole	6 months		

cases we are dealing with, the plane is supposed to be a flat horizontal surface without thickness. Perhaps the nearest resemblance to such an ideal condition will be found in a sheet of tissue paper held perfectly horizontal. The perfectly smooth surface of the body of water represents an ideal plane. Who has not seen the lake as smooth as glass, stretching away in every direction as far as the eye can reach. This then is your plane, pure and simple. The smooth horizontal surface of a floor, looking-glass, etc., represents a plane. A plane must be a surface without curvature. A plane may be real or imaginary. The plane of the ecliptic and the plane of the equator, are, of course, imaginary.

A plane is not necessarily horizontal. It may be a vertical plane, or an oblique plane. Now, what is meant by the plane of the ecliptic? The first thing to consider is, what is the ecliptic? The ecliptic is the real yearly path of the earth around the sun as seen from the sun, or the apparent path of the sun in the sky. The ellipse marked orbit in Fig. 1 then is the same thing as the ecliptic. The plane of this ecliptic then must be the flat (horizontal) surface lying wholly within the confines of the ellipse or orbit. Lay this magazine on a table and turn to Fig. 1. The plane of the ecliptic then is the flat surface of the sheet of paper lying within the orbit. This is the same thing as the plane passing through the earth's orbit. The plane of the ecliptic is also defined as that plane passing through the center of the sun, which contains the orbit of the earth. The line, or plane, to reach from the sun's center to the orbit of the earth, must, theoretically, pass half way through the earth to its center, if we consider the orbit to be only a line, hence half of the earth lies on either side of the line. If the path, or earth's wake, were considered to be the same width as the diameter of the earth itself, the plane of the ecliptic would have to pass all the way through the earth to contain the full width of the orbit. No matter how it is considered, the plane to pass from the sun's center to the orbit, must pass through the center of the earth, no matter where the earth may be in its orbit. This does not mean that the plane has to pass through the equator in order to reach the center of the earth. This is true only twice in the year, during the equinoxes. At all other times the earth occupies such a position in its orbit that there is an angle between the plane of the ecliptic and the plane of the equator. Sometimes the plane of the ecliptic strikes below the equator, and sometimes above. Wherever the plane strikes the outside of the earth the angular distance from there to the plane of the equator, or just simply to the equator, is equal to the sun's declination.

What is meant by the plane of the equator? A plane is an extended flat surface without thickness. Just imagine a sheet of cardboard of such dimensions that half of it would reach from the earth to the sun. Next, imagine a circular hole cut in the center of the cardboard just large enough to admit the earth. It wants to fit tight so that the earth cannot drop through the hole. Now, imagine the sheet of cardboard drawn over the earth and fitted so as to coincide with the equator all the way round. When this is done the sheet of paper represents the plane of the equator and extends from it in all directions. Half of the earth will be above the plane and the other half below it. Now, imagine the same thing done with the sun. The sun's axis is not inclined like that of the earth, and even though it were, it would make no difference, since the heat and light are equal all over its surface. This statement is not strictly true, but since it has nothing to do with this case, it will make no difference. Now, imagine the sun as a ball, as you see it on the sea horizon, on a bright morning. Imagine another sheet of cardboard stretched around the sun like that around the earth. This time the sheet of cardboard must be perfectly horizontal, and must encircle the sun at its middle, one-half above, the other below. The sheet of cardboard represents the plane of the ecliptic, and if carried to the earth would ultimately strike its center, and if the earth in its orbit happened to be in that position where it was inclined from the plane of the ecliptic, or the plane from the sun, as it might be called, the plane of the ecliptic would strike the earth on one side or the other of the plane of the equator, or simply to one side or the other of the equator itself.

A study of Fig. 5 ought to make this

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clear. The plane of the ecliptic, or the sun's plane, is easily understood. Now, imagine the line marked equator in the figure of the earth, continued the same length as the line marked plane of the ecliptic, and notice the angle they would make with each other. The line from the equator represents the plane of the equator, and whatever the angle is between these two planes equals the sun's declination. Fig. 5 represents the earth in its orbit about Dec. 21, at which time the sun's declination is 23½° south, because the plane of the ecliptic strikes below, or south, of the plane of the equator. See about Dec. 21, in Fig. 3.

When the earth is at the equinoxes of its orbit the sun is directly over the equator, or the direct or vertical ray from the sun, falls on the equator, or coincides with the equator. This direct or vertical ray from the sun falls on the equator, or coincides with the equator. This direct or vertical ray from the sun is precisely the same thing as the plane of the ecliptic itself. This then being true, that when the sun is directly over the equator, the plane of the ecliptic, the plane of the sun's center, and a direct or vertical ray from the sun, must each intersect the earth's equator and be at right angles to the earth's axis. As there can be no angle at such times between the plane of the ecliptic and the plane of the equator, there can be no declination.

Note.—In some diagrams showing the earth in its orbit, the earth's axis inclines just the other way from that shown in Fig. 1. It makes no difference in the illustration of the theory of the seasons, as well as the cause of the sun's declination, more than A would represent the earth at the March equinox; instead of the September equinox, and the winter and summer solstices, B and D in diagram, would be reversed. In either case the inclined axis would make an angle of 66½° with the plane of the ecliptic.

MUCH "HARPING."

In this chapter there has been much repetition concerning the same thing by presenting it in different ways; but the writer will not regret the loss of time and space if thereby he has succeeded in making this (generally speaking) hazy subject any clearer to the understanding of seamen.

The American Ship Building Co. is installing new boilers on the Coralia, 14 ft. 6 in. diameter by 11 ft. 6 in. long; also on the Siemens, 15 ft. 4½ in. in diameter and 11 ft. 6 in. long, and also on the Pathfinder, 13 ft. 9 in. diameter by 11 ft. 6 in. long.

QUESTIONS ANSWERED.

Editor Questions and Answers Department:

Can you tell me why the alarm signal in the present pilot rules was changed from "five or more" to "four or more"? I can't see the advantage of this change, in fact, I think it is inviting trouble rather than a prevention of same. I think this is a serious mistake and a danger to life and property.

OBSERVER.

If it were as easy to answer questions as it is to ask them the editor's work in this department would be greatly lessened. The editor heartily agrees with the views of "Observer," but if he wants to know just why it was done he will have to address the "powers that be" down at Washington for the answer.

The old alarm signal was "several short and rapid blasts of the whistle." As several means more than two, either three or four short blasts could be given and taken as an alarm signal. This signal became confused with the check whistle of three short blasts and the four short blast meaning to come ahead strong. It was owing to this confusion and the number of accidents that resulted from it that the rule was changed to five or more short and rapid blasts. This signal answered its purpose admirably and did away with any possible confusion with the three and four short blasts, meaning to check or to work stronger. This alarm signal seemed to fill the bill for which it was intended, and so far as known no complaints were made and everybody seemed satisfied. But it had a short life. Whether the change was made to distinguish between the danger alarm and the private fire alarm by whistle, the writer is unable to say. The narrow and crowded condition of our fresh water navigation is such that it justifies the use of the check and the "work strong" signals between the pilots of two steamers. Many an accident has been averted by the prompt blowing and action of these signals, but the government pilot rules does not recognize these as law. It is an unwritten law between pilots that three short blasts shall mean for the other to check or go slow. For example, one steamer is overtaking another, the one being overtaken desires the other to stay astern, blows three short blasts to go slow or slower. According to the pilot rules the alarm signal would answer the same purpose, but there are other cases where the alarm signal would hardly answer. For instance, supposing the case of where one boat is loading at a dock in a river or confined harbor, and another boat coming along at a good rate of speed is liable to break the other loose from her moorings. If the steamer moored would sound three blasts the other would know at once that she was to go slow until she got by the other. There are other conditions in addition to the above where this signal can be used to advantage. The same thing is true of the four short blasts to work stronger.

If every sailor would pay more attention to the law and its real meaning and less to customs and handed-down opinions, they would find their work much easier. The writer knows of one collision that occurred through a misunderstanding of an alarm signal. It was in the river and one vessel overtaking the other. The overtaking vessel blew for the side she wanted and the one ahead answered by blowing four short blasts, meaning an alarm signal (to keep astern), which was perfectly right according to law. But the fellow astern took it to mean to hurry up and get by. While the one astern had no business to interpret the signal as he did, it was the custom even if it wasn't the law, and he came ahead and endeavored to pass in a dangerous part of the stream with the result of a collision. This was a sheer case of carelessness on the part of the steamer astern for the mere fact that the other did not answer his signal for side. This should have been enough if nothing more. But still another case where signals had been agreed upon; the vessel ahead shortly afterward, blew four short blasts as an alarm or danger signal and the steamer astern took it to mean a hurry up signal. If the fellow astern had had any doubts as to what the signal meant he could have easily found out by blowing for his side again, the fellow ahead would have either answered with the same side signal or given him the same alarm signal, and then he would have known exactly what he meant.

All these kinds of trouble would be obviated if in this private code the "hurry-up" signal was blown the same as in striking four bells for time on a ship's bell, that is, two in quick succession with a short interval and then two more in quick succcesion. Pilots are gradually working into this, and in fact they are endeavoring to cut the private code down to as little use as possible

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for this very reason. It would seem that the government rules should make some recognition of these unwritten rules in order to wipe out any and all chance of mistakes. It would be all right if each man were sure that the other meant just what he said on his whistle, but as it is the one man must look out for not only his own safety but to the other's as well.

Here is another practice that is very wrong; the overtaken vessel blowing three short blasts in answering the signal for side given by the overtaking vessel. If the overtaken vessel does not deem it safe for the overtaking vessel to pass she must sound the alarm signal and not the check whistle. Although the overtaking vessel may understand the meaning of the signal if any trouble came of it the vessel ahead would have no law to stand upon and neither would the vessel astern, for that matter. Both could be found equally at fault.

INFLUENCES OF THE ATMOSPHERE.

The question "What controls the direction of the wind" has often been asked. There are many answers. There are primary and wide-reaching influences, and there are local influences. As an example of the primary cause, consider the rotation of the earth, taken in connection with the fact that atmospheric air is a fluid. The earth rotates on its axis from west to east at the rate of more than 1,000 miles an hour on the equator, and less toward the poles, at which it is stationary. Now, if there were no physical facts to modify the effects of the facts that the earth rotates on its axis and that the air is a fluid, the wind everywhere on the earth would seem to blow continually from the east, for the reason that the surface of the revolving earth would leave the air behind as it whirled around, very much on the same principle as the air suction at the rear of a fast moving train. The terrible hurricanes in the West Indies have a velocity of not much more than 100 miles an hour. The greater portion of the globe would be rendered uninhabitable for man by the violence of the wind, were it not that there are other physical facts to be considered than those of the rotation of the earth and the gravity of the air.

The earth has not only a motion on its own axis (rotation), but a motion round the sun (revolution). The earth's orbit or path, may be compared to a race-course on which it makes the dizzy speed of 500,000,000 miles a year. A man racing on horseback is apt to lose his hat if he does not tie it on, and it is for this very same reason that the earth, rushing through space at the rate of 1,100 miles a minute, does not leave its atmosphere behind. It is because of the law of gravity; the weight of the atmosphere ties it down to the earth, so that it moves along with the earth to a certain extent, and is not lost like a man's hat on horseback, in the earth's race around the sun, and not converted into a raging tempest by the earth's daily rotation on its axis, though there is possibly an altitude at which its general tendency is to stand still, or to respond reluctantly to the rotation of the earth, which would seem to make it blow from the east.

The force of inertia being neutralized in these respects by the force of gravity, other causes operate to produce and control the direction of the wind, the most powerful being heat and cold; and these are modified in turn by the configuration of the continents—by the distribution of land and water. When the sun shines on the land it quickly raises the temperature of the surface. When it shines on the water its influence is not as a rule so quickly appreciable, for the water is not at rest like the land, and absorbs heat to a greater depth. Its surface usually radiates less heat than land in summer and more in winter.

It is the pressure of the air that causes the wind. Cold air is heavier than warm air; dry air lighter than moist air. The heavier air displaces the lighter, and this makes the motion of the atmosphere called wind. There are permanent centers of high pressure on the great oceans which play an important part in determining the paths of traveling storms. But every hill and mountain and plain, every desert, every forest, every lake and every river on the earth, as well as the oceans, tend continually to modify the temperature or the humidity of the air in its vicinity, and with each modification of temperature or humidity there is a shifting of the air —a wind. The change from day to night and from night to day in every part of the globe tends to raise a breeze by modifying the temperature of the air.

Wind directions are in a very large proportion due entirely to local influences; and that generally they are quite separate from general circulatory effect. This, as a matter of course, is not applicable to the trade winds, which originate and for the most part blow in portions of the earth where there is little land and much water. Winds from large water areas are much more frequent on the Pacific coast and on the east coast of the Gulf of Mexico than on the Atlantic coast or the great lakes. This is not remarkable when the vast extent of the Pacific is compared with the relatively smaller expanse of the Atlantic coast and the great lakes. The subject of winds and their cause is one of absorbing interest.

DELIVERED EVERY BOAT.

The Great Lakes Engineering Works of Detroit delivered every boat in 1907 that it contracted to deliver, notwithstanding that the company lost five months by strikes and their effects. The bulk freighter Jacob T. Kopp and the package freighters Burlington and Bennington were not contracted for delivery during 1907, but for delivery at the opening of navigation in 1908. The steamer Kopp is already completed.

Wm. J. Woodside, ship broker, has moved to 25 California street, San Francisco, Cal.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., recently repaired the Baltimore, Chesapeake & Atlantic Railway Co.'s steamer Maryland. Several new plates in her bow were necessary as well as a new stem. The damages were sustained in a collision with the U. S. torpedo boat Shubrick.

The Pelly Dry Dock Co., South Brooklyn, N. Y., recently completed repairs and alterations to the iron steamship Caribbee. She has been converted into a molasses tank carrier as has also a steel barge for the same owner, Daniel Bacon, of New York. The cargoes of these vessels will be pumped out at the port of delivery.

Tregarthen & Walsh, New York, have almost completed the general overhaul of the steamboat Thomas S. Brennan, owned by the department of charities and corrections of the city of New York. She has been in dry dock since Sept. 1 receiving hull joiner work and motive power. The same company is repairing another of this department's boats, the Massassoit, her hull and upper works being given a general overhaul. John W. Sullivan, foot of East Ninth street, New York, is giving the engine and boilers of the Massassoit attention.

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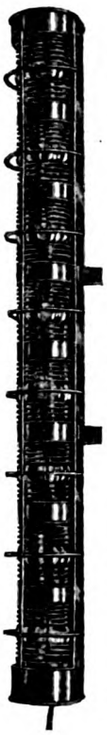

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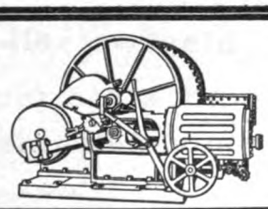
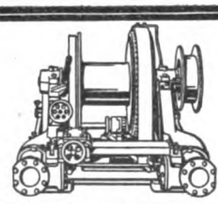
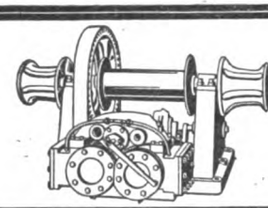

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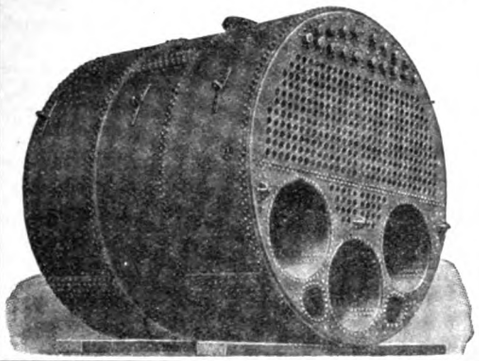

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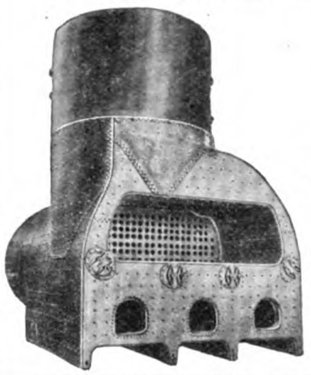

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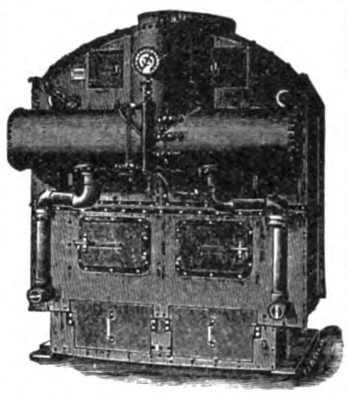

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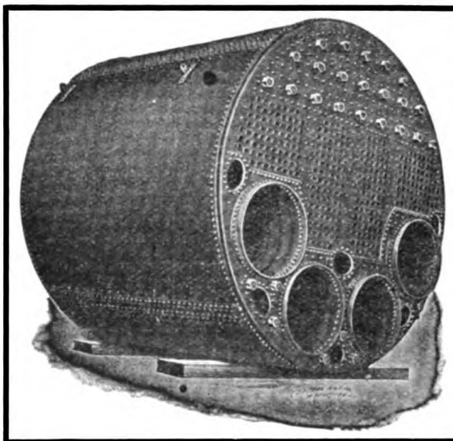

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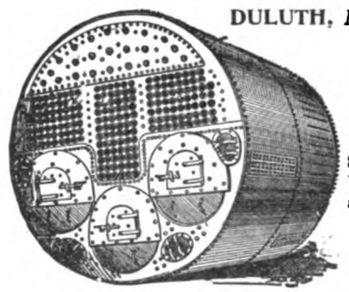

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